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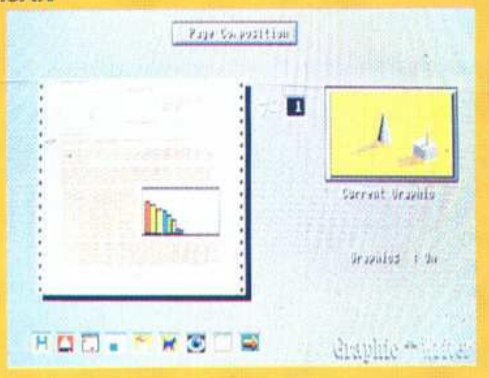

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> *MICRO USER April 1988*

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>
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Computer Concepts Ltd

Inter-Word

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Inter-Sheet

An easy to use spreadsheet on ROM. Features include 255 rows × 64 columns with individually adjustable width, full range mathematical functions, selective printing, lockable boxes/rows/ columns, 40/80/132 column screen modes, auto step on. BBC: £49.00 + VAT. Archimedes: £39.00 + VAT.

Inter-Chart

A comprehensive chart and graph plotting program on ROM. Features include bar graphs, pie charts and line graphs (up to 16 in memory at once, overlay/print in any combination) auto/manual labelling, accepts data from file/keyboard. BBC: £32.00 + VAT. Archimedes: £25.00 + VAT.

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A database on ROM, based around a powerful programming language. Features of the card index program include menu operation, variable field length & number of fields per record, unlimited records; full conditional search & sort, fast search via indexes. BBC: £60.00 + VAT.

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A&B COMPUTING

Volume Five Number Eleven November 1988

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This article may well make you want to buy an Arc!

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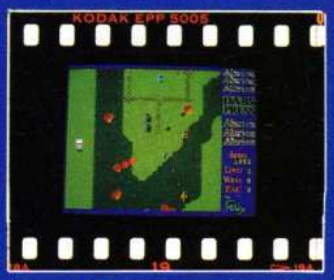

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Phew! At long last we have some games for Dave Reeder to play with. Loadsa hints 'n' tips PLUS the new Commander Stryker cartoon reaches its second introduction.

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ACORN NEWS

New joysticks (yawn)

Actually it's jolly exciting really isn't it chaps, after all, your Quickshot II must be well and truly knackered by now after buying it at that show three years ago?

Of course it isn't! But let's face it, you feel like a real *man* with one of these wonderful creations in your hands, just like in Star Wars, (or whatever ego trip you feel like reliving), you can *manfully* grab it, you can feel the power of your computer throbbing (*manfully*) through the aesthetically designed lines of your *manfully* produced Joystick.

Yes folks, I don't have to say where the hyperbole *really* is, but they do look jolly good, and it looks like gamers all over the country will, no doubt be buying these things in the millions as they are a damn sight better built than so many of the other joysticks available.

Take, for instance the <B4A>Megablaster <RB4A> (hey even the name is *manly*!), it is shaped like those old Atari joysticks that play brilliantly, but last all of three months, I hope it has a similar pedigree, but with a better lifespan!

The other joystick is the <B4A>Predator <RB4A>- a nice looker with four fire buttons, an auto repeat option and a really nice action (if you have *my* taste in joysticks that is!). Quite clearly this is a Quickshot II basher as it is similar is shape, size and stature.

No, I'm not going to say how wonderful they are, because that takes a few months heavy joystick beating. Now if they were to send them to Dave Reeder, our games columnist....

Seiko release new watch

Now I know what your all thinking, "what the hell has this got to do with the BBC Micro" and all that, but I must admit that these guys seem to know what they are doing for the average Beeb owner in the street!

The Seiko "data" series of watches was initially released some three years ago (was it *really* as long ago as that?), and it had a tiny memory, the straps eventually broke and you sweated the batteries to death (at least you did with mine)...

Anyway, Seiko have just released a new watch with connetions to the IBM PC and the BBC Micro – calling it the Seiko wrist terminal (RC-1000), the watch can take 80 pages of 24 characters for storing all those useful addresses, appointments, notes, credit card numbers (great if you've got the password option set!)

You can transfer a full "watches worth" of data in about ten seconds, so it shouldn't cause any delays when running for the bus, it isn't available in stores – and it will not ever be, (so their press company tell me), but you can get more information from **Pacific National, Chesham House, 136 Regent Street, London, W1R 5FA.**

What Have I missed out?... Oh yes, it tells the time as well!

Silicon Visionaries

"Oh, what's this?" said Darrin as he opened a disc box mailer just a few days before the colour deadline for the news section.

It was a disc labelled *SoliCad* and sported the name Silicon Visions, so it was *definitely* worth looking at, after all, they produced the *Realtime Graphics Language* and the *Realtime Solids Modeller* (based on their earlier release), but this looked like a whole new kettle of fish.

Just having looked at a similar package on the Amiga called *Sculpt 3D* and, of course the 3D package detailed in Gordon Taylor's Archimedes Report, I was amazed to see similar features – and more! running on the BBC Micro! The three images of the space schuttle coming together to form the 3D representation were there, the only difference was the small section of the screen taken up to replace what would have been a pull down menu on the Amiga.

The basic idea of the package is to create 3D reperesentations of an image out of the required 2D images created in each of the little boxes – as this was so soon to the deadline, we just *had* to put it in, even with such sketchy information!

This is *hot* ladies and gentlemen, no doubt about it. If you are interested in graphics then I plead you to have a look at this as it takes the BBC Micro yet another rung higher in the programming stakes – I don't know how these guys have done it, and it's too far away to be April fool's day, so there must have been some very clever programming going on here!

From the demo it looks like this is an application written using the RGL part of the solids modeller, either that or the same code has been incorporated into the SoliCad package, but whichever way you look at it, this is a package to keep your eye out for in 1989.

Of course the chaps at Silicon Visions could always come up with the software in time for the December issue eh?

(*putting on smug voice of self satisfaction to all you Atari owners out there*) Where's this on the Atari ST then eh?

● Contact: Silicon Visions, 47 Dudley Gardens, Harrow, Middlesex, HA2 0DQ. ☎ 01 422 2274.

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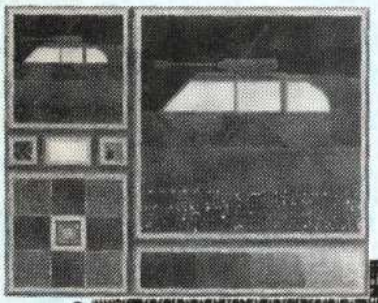

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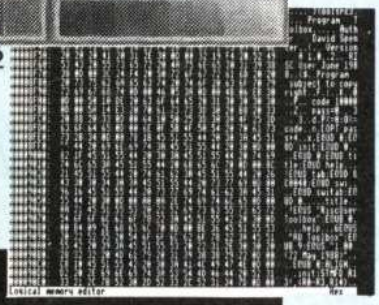

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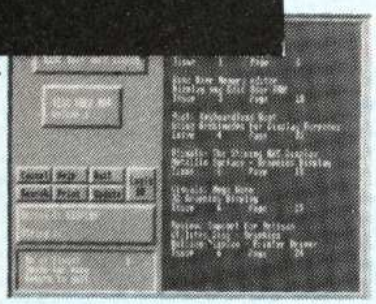

1 Pixel Editor

This powerful drawing tool is a full-screen full-feature pixel editor, for creating and editing screens and sprites.

2 Toolbox

This incredibly useful utility features a memory editor, memory search and replace, disc editor and disassembler. TOOLBOX contains many of the features found in packages costing over £35.

3 World in Motion

A stunning animation with an oddly reminiscent feel to it.

4 Arcscan

A fast on-screen bibliography with powerful search facilities for all the RISC User and BEEBUG magazines published. Normal price £12.

5 Disc Menu Module

Use the mouse to control your disc files with this extremely useful relocatable module.

6 Printer Buffer

This printer buffer frees your computer during long printouts and is configurable from a few bytes to 4 Mbytes. Similar to packages currently selling at £19.

Altogether the items on this disc would be worth over £50 if bought separately.

This is what you've missed in volume1

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Fast Directory Copier	6
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Full Screen Pixel Editor	4
Intelligent Auto-Configure	6
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. . . and much more

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This is just a small sample of the items featured in Volume 6

GENERAL FEATURES

ARM Wrestling
Archimedes (Acorn launch)
Overview of Computer Education
C Programming
Now C Here (Part 1)
Comms Problems
Intelligent Modems
Exploring Assembler
Introduction to Assembly Language
Animation
Colouring your Beeb Pt.2
Sideways and Shadow RAM
Animation (Trench)
Giant Bounce
Giant Scroller

60 In Depth Editorial Features

PROGRAMS : Applications

Chart Recorder
Circuit Analysis
Ghost Host (Bulletin Board)
Keystrip Generator
Marks Analysis for Teachers
Personal Appointments D
Printing and Transposi
Resistor Calculation
Video Cassette Cataloguer Pt.1
World by Night and Day

Over 60 Programs that you can type in (or load from disc/tape) ranging from a Full Screen Editor to a Bulletin Board.

REVIEWS : Books

Books for Serious Users
Master Operating Sys. (DABS Press)
The New Advanced User Guide (Adder)
Books for View
A Dabhand Guide (DABS Press)
Mastering View (Sigma Press)
Computing without Programming
The C Programming Language
The Recursive Universe

The latest News from Acorn and other major suppliers.

REVIEWS : Software

InterBase (Computer Concepts)
Master Emulation ROM (DABS Press)
PCB Autoroute (Pineapple Software)
PrintROM (Windmill Software)
Realtime Solids (Silicon Vision)
View Professional (Acorn Computers)
Word Power (Ian Copestake Software)
ADU ROM (Pineapple Software)
Acornsoft C (Acorn Computers)
Diagram II (Pineapple Software)
Fontaid (CJE Micros)
Genie (PMS)

PROGRAMS : Utilities

ADFS Menu for View
Animated Titling
DFS Utilities: *FREE and *MAP
Epson Character Definer
Function Keys
IBM to BBC Transfer Utility Pt.1
MIDAS Universal Disc Front End
Machine Code Cross Referencer
Mode 7 Menu Generator
Overlaying Techniques
Procedure and Function Analyser
RAM (Vectored Entry into)
ROM Controller (Improvements)
ROM Filing System Image Generator
Screen Dump for Mode 0

REVIEWS : Hardware

Music 400 (Hybrid Technology Ltd)
Pearl 8000 Data Logger (Innovations)
Quest Mouse (Watford Electronics)
Real Time Clock (Solidisk)
Z88 (Cambridge Computers)
Archimedes A440 (Acorn)
Co-Processor (Watford Electronics)
Hard Disc (Technomatic)
Linnet Modem
Series Four Modem
Master Cartridges

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GENERAL : Hints

InterWord and Long Commands
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Company Comeback

Our review of *AVP Computing's Pixel Perfect* desktop publishing package in the October educational supplement was challenged by AVP who kindly sent us a list of points they wanted to make. Unfortunately, because of publishing deadlines, we were unable to include them in the October issue and we therefore list them here.

It's worth pointing out that our reviewers always try to make contact with software publishers to ensure that no factual errors appear in our reviews. Matters of opinion cannot of course be subject to such controls. We are always interested to receive reaction to reviews in the magazine and where space allows and timing makes sensible, we will publish such feedback, from publishers and end users alike. Please submit copy for the "Company Comeback" section wordprocessed on disc if possible. We reserve the right to edit contributions.

Laurence Nauen, general manager of AVP has made the following specific points about Pixel Perfect in relation to our review. "*1. Pixel Perfect has 70 characters across on screen at any one time, similar to the best DTP packages and alot more than some; Typesetter for instance has 38. Working at that width is straightforward and similar to other programs although Pixel Perfect allows you to position letters and graphics anywhere without limitation at any size, and with full typesetting facilities such as kerning. Pixel Perfect has, in addition, a unique facility to make a page that is 120 characters across. Since you do not have the whole page on screen when working at this definition the layout of a newspaper title, for example, takes a bit of practice. 2. There is a facility to view two whole pages. 3. Pixel Perfect was designed to be used with any of the common wordprocessing programs and when text is prepared in any of these it flows into the defined boxes automatically and with full word wrap facilities. Pixel Perfect also has facilities within the program but because you are typing onto a graphics screen they are a little tedious. 4. Already AVP have a specialist series of human anatomy diagrams for use with Pixel Perfect and a number of other subject areas are in preparation. 5. Whilst Stop Press has 17 fonts, they are produced on a 16 by 16 grid compared to the 48 by 48 pixel grid for Pixel Perfect. 6. The power of Pixel Perfect lies in its capacity to create graphics and import graphics and words and lay them out in a totally flexible way. There was no intention to duplicate the facilities of a wordprocessor.*"

Oops

Apologies for not crediting Graham Bell as being the author of the A&B Faxsheets pages in September's issue, or for crediting DABs press for being the publishers of the book *Guide to ViewSheet and ViewStore* from which the pages were taken.

Archimedes 16 bit Parallel I/O interface

Intelligent Interfaces have just released their 16 bit parallel interface for the Archimedes, placing the machine fairly and squarely at the top-end of micro and robotic control applications.

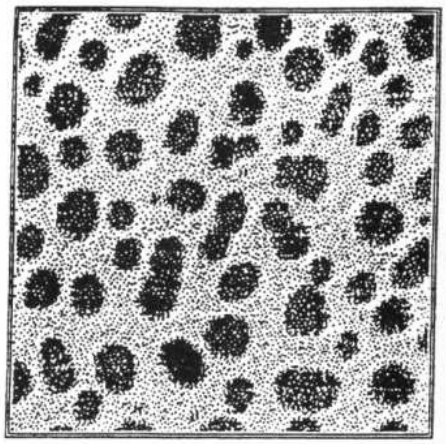
It is, they say, *"the first expansion card to exploit the full potential of the Archimedes 16 bit wide expansion bus enabling full high-speed transmission for digital input and output"*.

Intelligent interfaces tell me that the package is ideally suited for control applications, and has already enabled users to connect the Archimedes to an Astronimical Telecope, thus replacing a Minicomputer previously used to control its movements.

The nice thing about their I/O interface card is that it has *two*separate 16 bit ports which can be configured as either one 16 bit input or output port with two handshake lines, or as two separate I/O lines of 8 bit length – each with two handshake lines (both can be programmable and accessed from BASIC.

Contact: Intelligent Interfaces Ltd. 43B Wood Street, Stratford-upon-Avon, Warwickshire, CV37 6JQ.

Seeing the light



The people at the Delft Center for Image Processing **have really been busy at making a name for themselves (see last month's news item). This month they sent us their latest reference manual for the Archimedes. Called the** AIM **(Archimedes Image Manager), this package is not only Public Domain, but it looks pretty damn good as well!**

After the release of the *Image Processing* package for the Atari ST was finalised and well under way, on the initialtive of Dr Ir.Frans Groen, the package was ported across to the universities larger systems including their Sun mainframes and, of course, the Archimedes.

Written in C, the AIM package contains utilities for adapting images on a video screen; contrast and edge enhancement are this packages forte, and there are many applications are in the field of science and medicine. Currently the AIM software is being used to improve low contrast images of the moon's surface. The software running on an Archimedes requires at least a megabyte of memory (now almost a standard requirement for anything serious) along with a Multisync monitor.

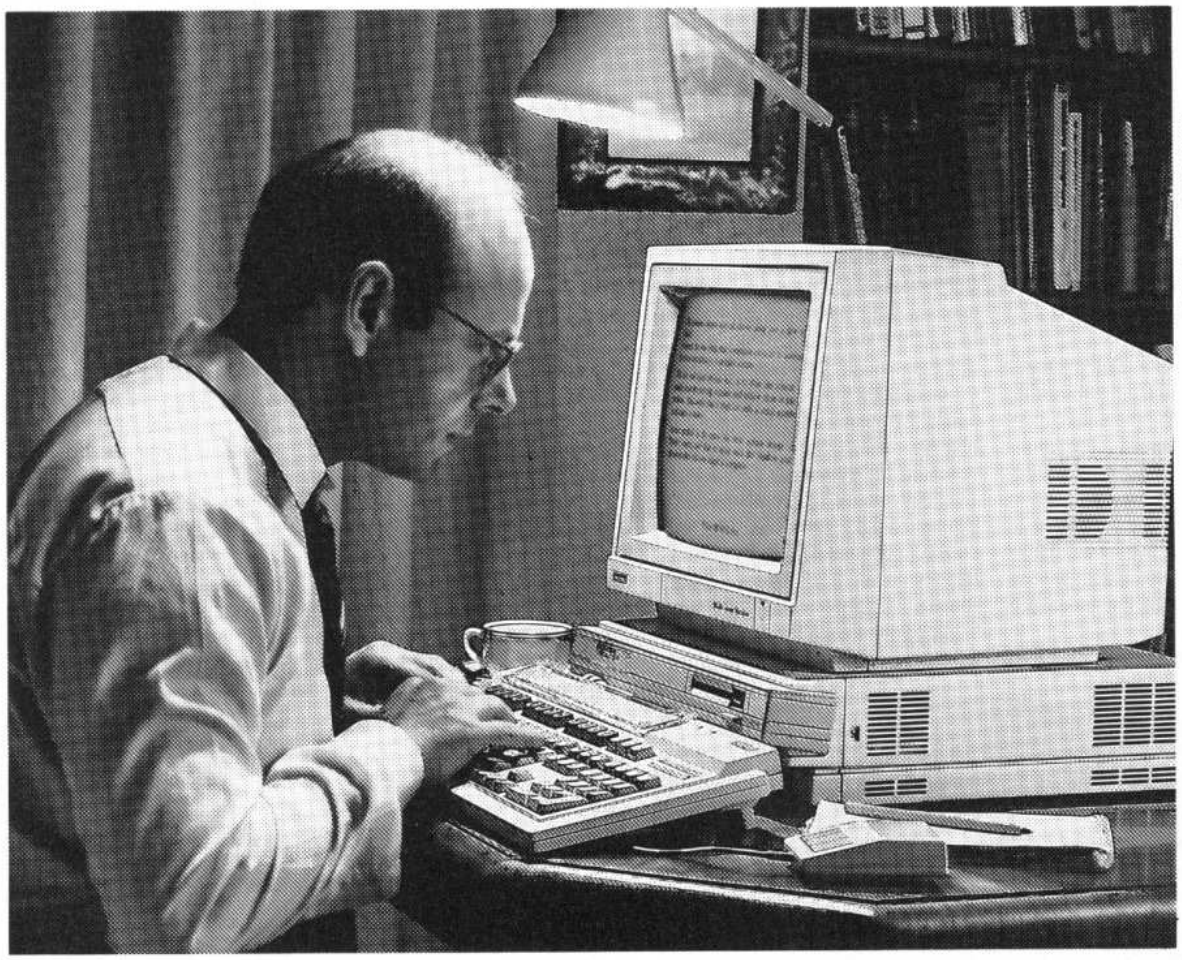
The release of this software has been made possible because of a unique development between the university and the Dutch distributor for Acorn, Eeckhorn Computers B.V. and the local dealer in Delft, ECD.

Yet another example of how Europe is spurning the PC applications in favour of more powerful systems.

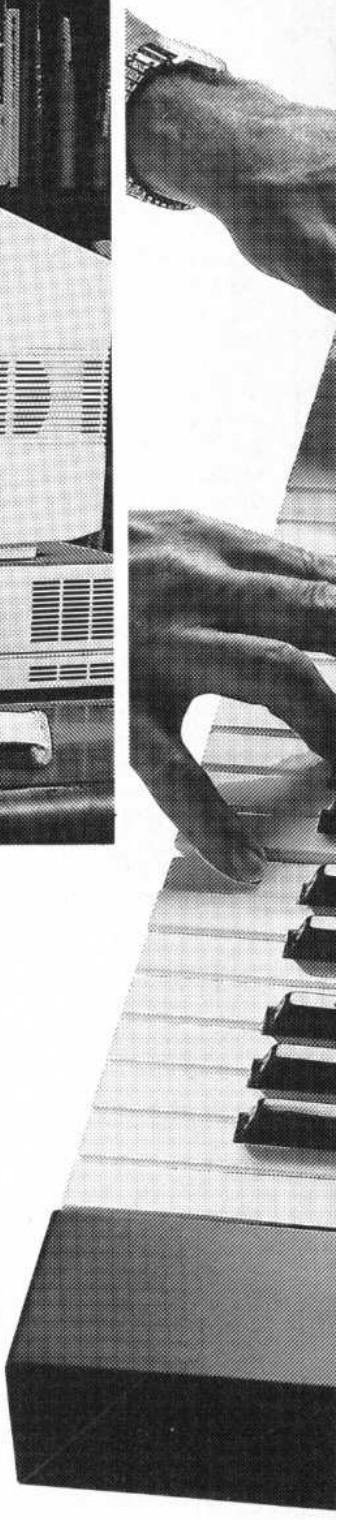
Contact Eeckhorn Computers B.V. ☎ 31-15-569365.

JOURNALIS

(What other micro has



Whether you are producing a social club newsletter or writing your life story, the Archimedes system is simplicity itself to use, producing a crispness and clarity of image second to none.



Whether you are an enthusiastic beginner or the most experienced musician, the ability of the Archimedes system combined with the appropriate software offers you a superb music work station. Add a MIDI (Musical Instrument Digital Interface) instrument and you enter a world of unlimited music control.

M OR JAZZ

the power to do both?)

Using Acorn's extremely powerful RISC chip, the Archimedes High Performance computer system is probably the most versatile of any microcomputer.

One of the first things that will impress you is how easy it is to use.

You'll be up and running almost immediately.

Virtually all the applications software you are ever likely to need is available to exploit the speed and power of this remarkable computer.

As a further demonstration of versatility, the Archimedes system, with its optional PC emulator, can run a vast range of MS-DOS software.

It's the perfect solution for practical disciplined work or for flexing your creative muscles.

Archimedes

Tel: 0800 678 888 (Free call anytime).

To: Acorn Computers Limited, FREEPOST (TK960)
Brentford, Middlesex TW8 8BR.
Please send me the Archimedes power pack with relevant information on applications packages.
I indicate below my particular area of interest.

☐ Business application ☐ Healthcare ☐ Education ☐ Home use
☐ General interest ☐ Other? (please specify)

Name_____

Company/school/establishment:_____
(if applicable)

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AB1J

Acorn
The choice of experience.

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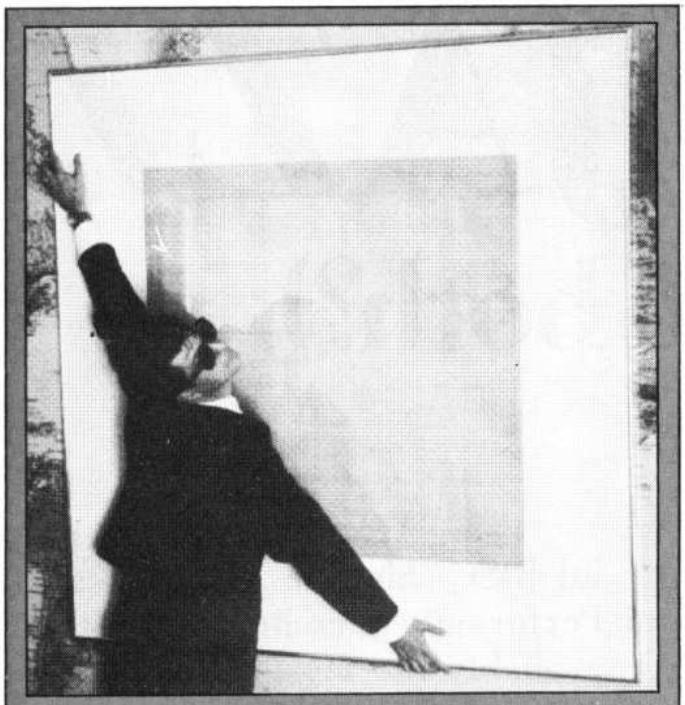


Budding Entrepreneur or Rip Off Artist?

I don't know whether I should run this story, but what the hell? I received this *interesting* little piece of information from **One Million Squares**, do this is not a sly dig at the PC owning population of Europe (there's far more than a million), no, this is a gentleman called Max Michaels and he is an "artist".

The scam is that he has drawn exactly a million squares and he is selling them for £1 each, in his words:

"your mission, should you decide to accept it, is to inform your readers that they may purchase and exclusively own part of an original and unique work of art"

Heh Heh, this guy's extracting the urine, I thought to myself, but he is apparently throwing in a honorable side to the deal, for every £1 he receives, he will donate half of it to the Save the Children Fund – and to make it all above board, he asks for two cheques, one (including VAT) made payable to "One Million Squares" and the other to "Save the Children".

"One million Squares" is on display at the artist's home in Brighton and viewing can be made by prior appointment.

Cheeky devil or just plain scam merchant? Either way, if you go for this then he is going to be a very rich man...

Archimedes times boats at Cowes

Estimated timings for over 700 boats competing at the International Cowes Regatta earlier last month were successfully calculated on an Archimedes at the famous Royal Squadron Yaughting Club. The bespoke software package **Yaught Race Courses** was developed specially by Computer Tutorial Services – apparently the sole distributor for the Archimedes on the Isle Of Wight.

This rather specialised package was developed to record the weather, tide and class of boat entered and gives an estimated finishing time for every competitor. The information is presented in graphical form to the race officials situated near the finishing line.

Details of the software's accuracy were not forthcoming.

Royal Baby gives old package a boost

Micro Aid **have jumped on the bandwaggon pretty quickly with the timely re-release of the *Family History System* for the BBC Micro *coincidentally* appearing a few days after the arrival of the Duke and Duchess of York's first child.**

The Database supplied with the package containing a pretty interesting genealogical history of the royal family now includes the record of the Princess of York – born on the 8th of the 8th 1988. (Gosh let me wipe away a tear! – Ed).

So what?

Other than the fact that the Royal baby has given the package a boost (and no doubt a few more sales) – do Micro Aid really think they need to use this sort of cheapo advertising to promote a pretty nifty piece of programming?

Still, thankfully there is something more relevant to tell you, which is the news that Micro Aid have finally ported the package across to the Archimedes – it retails at £25.52, whereas the BBC Micro version weighs in at £20.52.

Considering the fact I looked at a £299 package for the IBM PC last week as a possible inclusion to the 512 Club, I don't think I'll bother, Micro Aid's package is better and now the Arc's speed and power can be put to good use even in the dusty old halls of the genalogist's office.

Contact: Micro Aid, 25 Fore Street, Praze Cramborne, Cornwall, TR14 0JX. ☎ (0209) 831 274.

Acorn at the British Lab Week show

At this year's British Laboratory Week (to be held in London's Olympia from the 11th to the 13th October), Acorn will be showing off their latest medical and scientific applications for the Archimedes range of computers.

Being no strangers to the world of medical and scientific control applications, this will be the first time that the Archie will be shown off in this context in the UK, and there are a great deal of excited punters already getting ready for it.

Of all the software packages to be shown off at the exhibition, one looks very interesting in that it is a spreadsheet – but with a difference; **Matrix 3** (as it is called) is a standard spreadsheet, but with the added dimension of depth, enabling numbers to be "stacked" and calculated in this third dimension – particularly useful in scientific applications and certainly useful for fast calculation of chemical information.

A new IEEE 488 interface is also to be unveiled for the first time, (see the Intelligent Interfaces news item) – this will enable the Arc to be connected up to 14 compatible test and measurement devices including oscilloscopes, spectrum analysers, counters, plotters, volt meters and programmable power supplies.

Looking good Acorn.

What's up DOC?

A new software package from *BSG Digitalle Illustrationen* – a company based in Cologne, have just released a software package called DOC Professional **for the Archimedes.**

As you may have guessed, DOC stands for Database, Organization and Charts and is probably the first integrated database on the Archimedes package to support different languages (German and French). It costs £31.60.

BSG claim that the database can store about 7,000 addresses (in an Arc 310) and that the mean retrieve time for a record is about 0.3 seconds.

It's cheap, it seems quick, and you bet we're already looking at it!

New User Group in Belgium

A new user group in Belgium has been set up! Called the Belgian Archimedes User Group **(also known as BAUG), they have been set up to *"support and reach Belgian Archimedes users"*.**

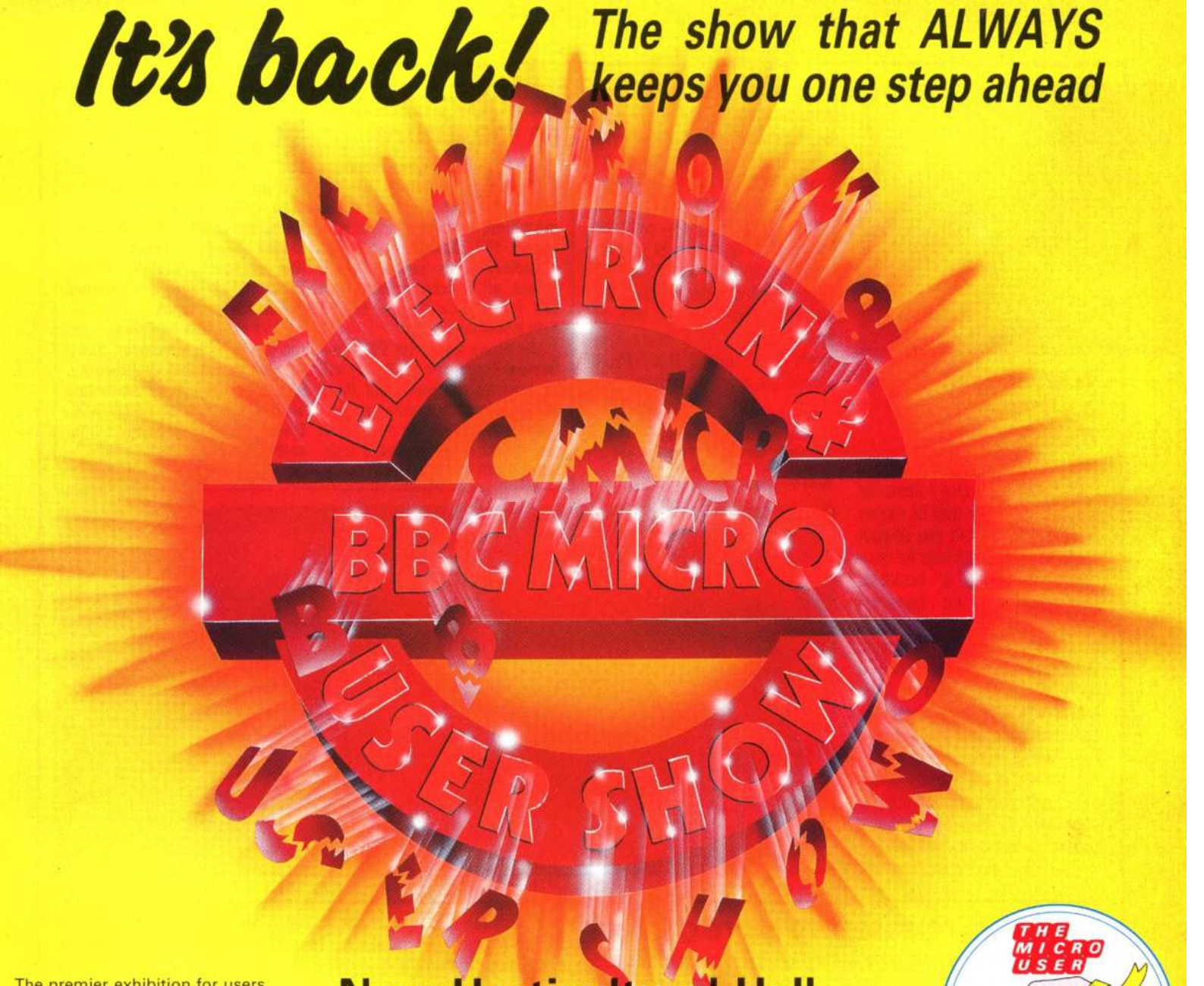
The organizer, Philippe Stroobandt, tells us that A&B is widely available in Belgium and that the BAUG is set up under the supervision of the Home Computer Club – a reputable organization geared more towards information and support than software piracy.

Keep us posted guys, things are looking very good for the Archimedes out there in Europe!

Contact: Phillipe or Yves Stoobandt c/o BAUG at Meidoorniaan 17, 1851 Grimbergen, Belgium.

It's back!

The show that ALWAYS keeps you one step ahead



The premier exhibition for users of all Acorn machines returns to its popular venue in the heart of the capital.

Traditionally the liveliest event of the year on the Acorn calendar, the pre-Christmas show is the one you just cannot afford to miss.

It's your value-for-money passport to:

- 70 exhibitors displaying all the latest developments across the entire Acorn range.
- Archimedes World – which provides a fascinating glimpse into the current and future roles for this remarkable machine.
- Technical advice from the UK's leading experts on all Acorn computers.
- Hundreds of special offers for the BBC Micro and Electron waiting to be snapped up as top-value Christmas presents.

All this – and so much more – at the 20th record-breaking Electron & BBC Micro User Show.

You can even save yourself £1 before you get there by using this advanced ticket form.

New Horticultural Hall, Greycoat Street, London SW1

10am-6pm Friday, November 11
10am-6pm Saturday, November 12
10am-4pm Sunday, November 13

Advance ticket order

SAVE £1

Please supply tickets for November show:

☐ Adult tickets at £4 (save £1) ..... £.....

☐ Under-16s tickets at £2.50 (save £1) ..... £.....

☐ Cheque enclosed made payable to Database Publications Ltd. Total £ _____

Admission at door: £5 (adults) £3.50 (under 16s) Advance ticket orders must be received by November 2, 1988

☐ Please debit my credit card account: ☐ Access ☐ Visa Expiry date: / /

Name .....

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.....Signed.....

Post to: *Database Exhibitions, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.*

DATABASE EXHIBITIONS

PHONE ORDERS: Ring Show Hotline: 0625 879920
Prestel Orders: KEY *89 THEN 614568383
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A510

Take a stroll down Innovation Row – a brand new show feature area, specially constructed for the event.

See the grand finalists displaying their breakthroughs in public for the first time. And you can help pick the winners by casting a vote in both categories of the awards – BBC Micro and Archimedes.

How to get there

Underground: The nearest tube stations are VICTORIA (Victoria, District and Circle Lines), ST. JAMES'S PARK (District and Circle Lines) and PIMLICO (Victoria Line).

By British Rail: VICTORIA STATION. The halls are a 10-minute walk from the station.

By Bus: 11, 24, 29, 70, 76 and Red Arrow 507 to Victoria Street – alight Army and Navy Stores.

Want to be a yuppie millionaire?

Thirty pounds spent on a copy of RBRC Software's *Don't Panic* for Model B or Master may be money well invested should you or your students find an aptitude for successfully running a business. Don't Panic is the home/fun single-player version of RBRC's simulation Crisis Management. Gregory Fothergale has had a heart attack and is expected to be out of action for two years. The bank has appointed you as Chief Executive of Fothergale Company Ltd, makers of the famous "Castaway" disposable shirts. Your two objectives: to keep the company solvent, to increase its profitability.

The simulation takes between a half and one hour to play. You organise marketing, production, buying raw materials, warehouseing and delivery, investment for expansion, altering manpower and deciding the annual wage round. It's no easy ride and you will have to get used to failure as well as success with this "game". But for anyone with an eye on business (some 45% of boys and 25% of girls according to a recent Barclay's bank survey) Don't Panic should prove an interesting challenge.

Details from RBRC Software, The Guild House, 32 Worple Road, Wimbledon, SW19 4EF. ☎ 01 946 8641.

RESOURCE look to the future

There has been a good response to the early publicity of RESOURCE's 1988 conference and exhibition, "Into the Future with ESG". 180 Delegates and 28 exhibitors have now reserved places at Doncaster Exhibition and Conference Centre on the 17th November.

Dr Philip Lewis (of DES) and Dr Noel Thompson (of NCET) will be keynote speakers and there will be conference seminars discussing the effect the new 16 bit and the 32 bit Archimedes technology will have and also topics on the throny subject of the Education Support Grant.

Representatives from Acorn and Apple will be there, A&B will be buzzing around keeping their collective eyes and ears open, and there will be an plenty to look at and talk about from the like of Acorn, CERES, MESU, DES, NERIS and the dreaded Reserarch Machines.

As I said, the conference will run on the 17th Novemver, and if you are interested in attending, please contact Anne Swainston or Kevin Smith at RESOURCE, Exeter Road, Wheatley, Doncaster, DN2 4PY. ☎ (0302) 63784.

Formatting for the Arc

Disk formats change and the market-making manufacturers from Japan have brought us the 3.5" standard. The Compact and now the Archimedes use this new format but what do you do with the 5.25" based software you've accumulated. Well,if you are selling your BBC Micro system to upgrade to Arc why not hang onto the disc drive because with *Computer Spares'* buffer board you can attach it to the newcomer.

The Computer Spares buffer board also features (uniquely we believe) a power socket so you can use your drive even if it was powered from the old Beeb. The power is drawn from the hard disc outlet. There's Arc software for transfer from DFS too, so Model B owners (including those with Watford DFS) can make a smooth transition.

The board sits neatly in either of the lefthand (looking from the front) podule panels at the rear of the Arc and hardware links allow you to select your own external drive number. The add-on drive is compatible with internal dual drives and hard discs through daisy-chaining.

The transfer software is mouse-driven, handles 40/80 track, single and double sided drives.

Inclusive prices are £55.20 for single drive version, £57.50 for dual drive version. Subtract £3.00 from your order if you don't require the metal blanking panel.

Computer Spares Ltd, 61a Braemar Drive, Highcliffe, Dorset.

Minerva release two more games

Clearly not content with sitting on their laurels for too long, Minerva have, after the success of their first two games, (Hoverbod and Missile Control) released two more games for the Archimedes.

The first game, called **Orion** looks to be a welcome return of the good old fashioned Defender-style shoot em up, where you *"skillfully manipulate Orion, the latest air to air combat interceptor"*.

The basic premise looks remarkebly simple, By shooting down the marauding aliens before they shoot you, you score points by saving your men before they are turned into mutants (Minerva don't tell me why!), that's not important, what *is* important is the fact that these mutated men turn on *you* when they are converted!

There are a whole host of other baddies just waiting to be shot at, such as pods that explode into swarmers, and waves of bombers, oh yeah, of you fail in your quest, the planet will explode for no immediately explained reason.

It is based on the "all time arcade classic" (their words not mine), and I can't wait to get my hands on it...

The other game is decidedly odd – I mean, have Minerva started feeding their programmers with weird substances? Try this on for size;

Sir Freddy is a sneaky and mean man who lives in a castle on an island. He turned green with envy when you built a better and stronger castle across the sea.

Because Sir Freddy is a mean old sod, he decides to blow up your castle by bombing it (suspended by balloons so that he doesn't get wet).

Weird stuff.

So anyway, You employ a gun crew to build a battlement with a good view to shoot down Sir Freddy in his balloon, speeding up the arms race, he 'phones the ship shop (!) and hire some gunships to shoot down your cannon crew – your task is to shoot down all this associated warmongering garbage otherwise Sir Freddy will win.

So what's next Minerva? *Sir Freddy II – let's get a really big bomb and see the world slip slowly into Defcon 2*, now you may think there is a case of double standards going on here, but judging by Minerva's press blurb, it looks to be the sort of game that is aimed at the very young.

Preparing myself from the onslaught one Nova Fisher will probably hurl at me because of this news item, you must remember that Minerva were probably the first company to start releasing games for the Archie, and their software is good quality stuff, but perhaps this game is a *leetle* bit dodgy if you are aiming it at the young?

Naturally bloodthirsty little teenage horrors will suck it up, but for children, well there are some things better left for later on in life.

They call it enchanting, I call it pretty sad, still, I can't wait to play it!

Contact: Minerva Systems at: 69 Sidwell Street, Exeter, EX4 6PH. ☎ (0392)37756/410137

TECHNOMATIC

17 Burnley Road, London NW10 1ED. Tel: 01-208 1177 Fax: 01-452 1500
305 Edgware Road, London W2. Tel: 01-723 0233 Telex: 922800

ARCHIMEDES, BBC COMPUTERS & ECONET REFERRAL CENTRE

ARCHIMEDES

System	Basic	Mono	Colour
305	£685	£735	£885
310	£799	£855	£999
310M	£859	£919	£1085
440	£2399	£2459	£2625

Ask for our list of Arc Add-ons and software.

Buy a Model 310 or 440 from us and we'll offer you

EITHER

A voucher worth £100 before VAT redeemable against any future purchase from us

OR

Auto Sketch CAD Program **£79,**
Inside AutoSketch Book **£15**
and two packets of 3M 3.5" Discs **£26**

AND

5% discount on any Archimedes add-ons
10% discount on any Archimedes software purchased at the same time.

BBC MASTER

BBC Master AMB15 **£356(a)**
We include free Educational/Fun Bundled software from BBC Publications range (RRP £40) and a STARdataBASE package worth another £40

MASTER SUMMER SPECIAL
Master AMB15+512 Co-Processor for only **£420(a)**
(Allow £5 extra if you would like us to fit the card for you)
512 upgrade includes 80186 processor with 512K RAM, DOS+, GEM Suite (Desk Top, Paint & Write) and Mouse
This offer valid while stocks last.
Ask for list of DOS software compatible with 512.

WINCHESTER DRIVES

TECHNOMATIC Winchester range covers drives from 20Mb to 70Mb capacity and are available in various combinations with floppy drives and tape streamers.
The Winchester Drives are supplied formatted and are ready to connect to the computer fitted with an appropriate disc filing system.
For the Master users we supply a front end utility which displays the total contents of the drive in icon format and enables you to load any file from there.

ACORN 512

80816 Co-Processor includes DOS+, GEM Suite (Desk Top, Paint & Write) and Mouse for only **£90**

To be launched soon technoCAD

The most comprehensive CAD system for the Master. Host of innovative featurs for creating complex drawings, pcb layouts, sketches etc. Virtually no restrictions on drawing sizes. One screen scaling for plotters, variety of screen dumps for compatible printers

FREE

evaluation disc available on request. The disc contains operating instructions and will perform as release version except for file functions.

MONITORS

A range of monochrome, colour and multisync monitors. New additions to the range are:

Philips 7752 14" green screen monitor featuring: Flat Screen, reverse video, separate brilliance and contrast controls. **£85(a)**
Ideal for DTP/CAD/Word Processor applications

NEC Multisync II 14" **£479(a)**
Suitable for Archimedes and PC compatibles

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For details on rest of our range please ask

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A range of reliable, well constructed, attractively packaged floppy drives. The quality and reliability of these drives enables us to offer a two year warranty on all our floppy drives.

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The range comprises of single and dual 5.25" and 3.5" drives with or without integral power supply. All connecting cables included. 5.25" drives can be switched for 40 and 80 track operation.

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A wide range of printers and plotters available from stock at competitive prices. Following are our typical prices:

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Ask for our full range of printers, plotters and accessories

ECONET ACCESSORIES

Full range of Accessories are available from stock.

Acorn E01/E20 File Store with dual 3.5" drives and a 20Mb Winchester **£999(2×a)**

SOFTWARE

Our software range for Archimedes and all BBC models includes: Language, Productivity, Applications and Educational packages.

It is not possible to include details of our complete range of products. Please complete the coupon or phone for our comprehensive catalogue.

We accept orders from Government, Educational and national organisations. Orders can also be placed by sending the appropriate remittance or with VISA/ACCESS cards. For fast delivery phone 01-208-1177.

Prices do not include carriage or VAT.
Carriage code. (a) £8.00 (b) £2.50 (c) £1.50 (d) £1.00

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Peter Clements

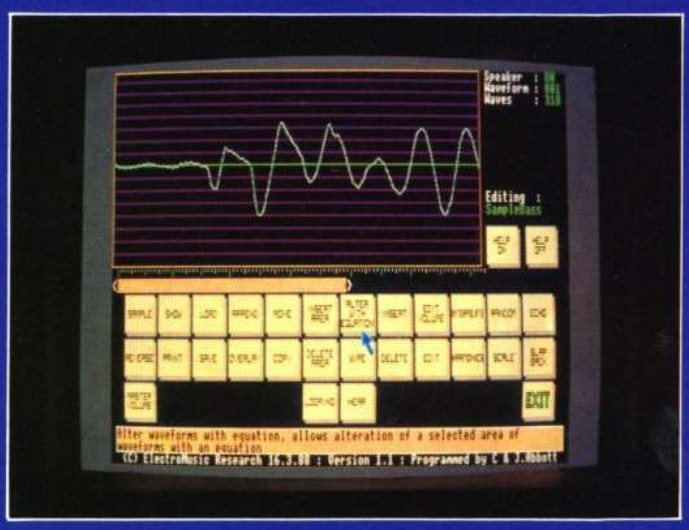
WARNING!!

I work for BBC Television, in the Photographic Processing Unit within the Graphic Design Department. I am in charge of a small group of technicians and recently we took delivery of a new camera which could provide graphic designers with an almost instant turn round of work. The requisition forms that they must provide us with and a graphic training tutorial were created using Stop Press. Before I bought Stop Press I was using a Brother HR5 thermal printer and when I discovered that it wouldn't work with Stop Press I went out and bought an Epson LX800. The moral of the story: *that's how good I thought the software was.*

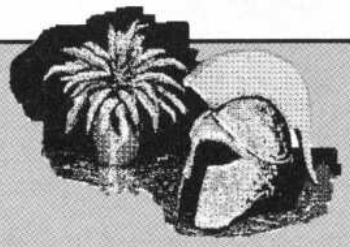
Now I don't often go and buy a new printer just because I like a certain software package but I would certainly buy an Archimedes just to run *Artisan*. This must be the ultimate painting program for any home micro. It is superb. I cannot find words to describe what I felt when using it for the first time. The adverts are right, the boys at *Quantel* might be a little upset at what this program can achieve. The picture of the Greek Helmet on the stone plinth was drawn by myself in a relatively short space of time.

Although you can only have sixteen colours on screen at any one time, any of those sixteen colours can be redefined from the palette of 4096. I hear that Clares are working on a professional version to be released sometime in the near future. Input via the mouse is again very important for me. I would never have had the patience to have achieved the same results using any other method.

Ease of use is also an issue when it comes to using *View*, a long trusted word processor for the BBC range of computers. I could never really come to terms with it. The commands required to set the page length, margins etc. totally baffled me. For me it just wasn't user friendly. Astonishment then, when I purchased *Graphic Writer*, again, another from the Clares stable. This word processor is ideal for me and in only a few days I was understanding what it could and could not do. For example, there is the ability to mix graphics with text, and the way of selecting italic, bold or plain lettering is simplicity itself. You can probably guess that I'm going to say that this entire article was written using this software.



Music has held my interest for a long time now, computer generated music especially so. I mentioned earlier that I owned a 'Music 5000' synthesiser. Although the sound on the Archimedes is adequate it comes no where near to the quality of the afore mentioned. It is greatly improved though, by connecting to an amplifier. Again, I have been spoilt by owing a 'Music 5000' but if anyone who hasn't owned one buys an Archimedes then I am sure that they will find the quality of sound vastly superior to the BBC Micro's internal sound chip.



Warning! This article may well make you buy an *Archimedes*

Let me say first of all that this computer is, to my mind, brilliant!, much better in fact than the magazines made it out to be when it was launched. Of course this is only my opinion, but I am a computer user and at the end of the day it's the computer users that determine whether or not a particular machine is going to survive.

As of the time of starting to write this article I have owned an Archimedes 310 for one whole month. Mark Webb gave me the task of writing about it. My brief was to keep it simple, not too technical, a sort of first hand experience, what made me buy it, how it compares to the Beeb, what I use it for sort of article. I was given six weeks, plenty of time you might think, but I have to admit that the reason I have only just started has been due to the fact that I have been absolutely engrossed in the machine and what it can do. I haven't had time for sleep, let alone for writing. Before I talk about The Archimedes in comparison to the Beeb I'll set the scene so far.

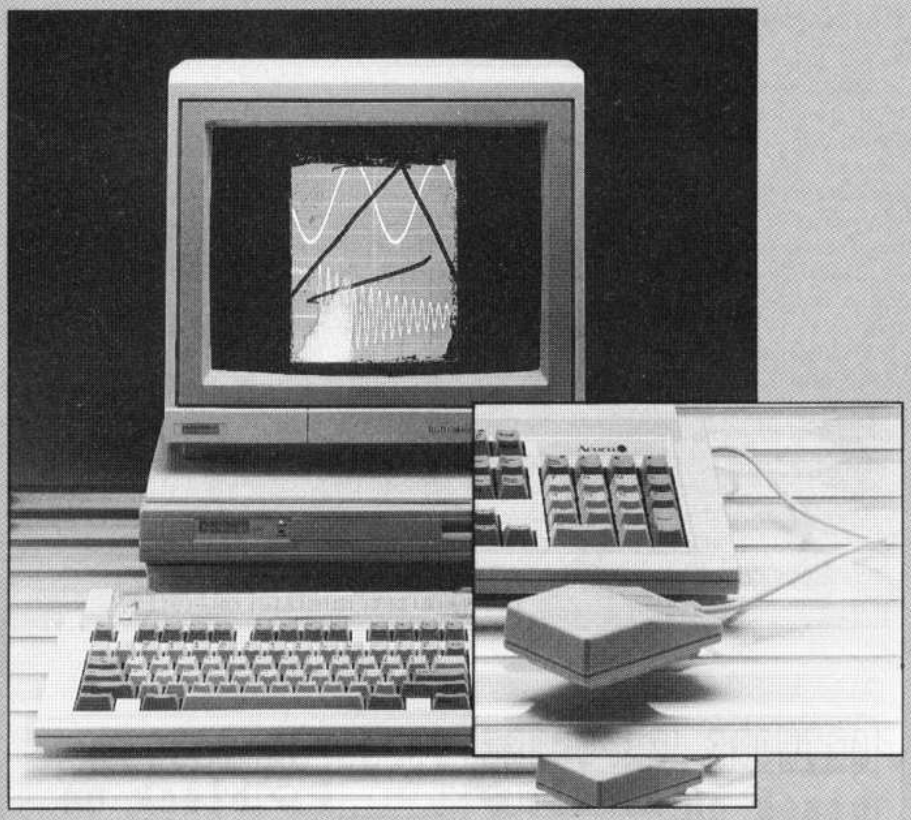
I started taking an interest in computers in 1983, I don't know why. I probably felt that as I was in my early thirties I didn't want to be left behind. I came home one day with a ZX81, much to my girlfriend's amazement, who remembers me saying that I could never get interested in computers at all. Having outgrown this first computer after only a few weeks I progressed to a Spectrum and spent weeks totally involved in producing animated displays such as a dripping tap and a bottle of Fairy Liquid complete with animated stopper popping open and releasing a thick green goo to the bottom of the screen. After realising that the sound wasn't up to much I changed yet again, this time to an Electron. I think that by this time I had realised that my interest in computers lay in sound and graphics, and on discovering that the BBC B had more sound channels than the Electron, I changed once again. My first three computers were bought and sold all in the first year, but I have owned my Beeb for nearly five. Not for one moment did I think that I would be buying another.

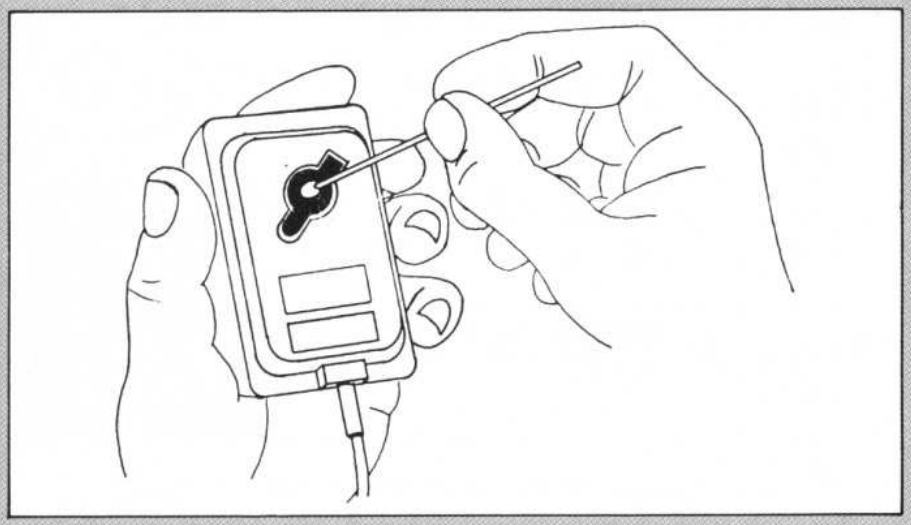
Wise choice

When I bought my Beeb I knew I had made a wise choice, if I had wanted to expand the system, I could, very easily. The range of software and peripherals available for the machine ensured its long life. I was never very interested in programming, I found that I was using the computer as a tool for graphics, music and word processing, and with readily available programs which suited my needs I only needed to know how to use them. The only packages that I was using with my BBC Micro prior to buying The Archimedes were *Pagemaker* (now *Stop Press*) and *View*, and apart from a few really good simulators, *Revs* and *Aviator* and my *Music 5000*, nothing held my interest for any great length of time.

Now you're probably thinking that I'm going on a bit and that I haven't talked much about the Archimedes but I think that it is important to mention how I progressed to the Beeb and the uses to which it has been put. Maybe some of you have trod the same path and owned the same computers as myself before deciding to purchase an Archimedes.

The question that I had to ask myself was, "Can I justify spending all that money on a computer?" It is a very expensive machine after all. I didn't just rush out and buy it, I





Although I am greatly impressed with my new computer something happened to the mouse which I feel I must mention. The pointer started misbehaving. I thought that at first the ball was slipping on the cork tile. When the mouse was moved down, the pointer moved up the screen a little and then went down. It wasn't enough to worry about but after a very short time it got worse. I made a few phone calls and was told that it could be the keyboard. Horrors! (thankfully unfounded.)

On unscrewing the four screws underneath the mouse I had a look inside. There are two thick plastic screws side by side on the right and another pair at the back. I found that turning the pair on the right affected the horizontal movement of the pointer whilst those at the back affected the vertical. All I had to do was to carefully adjust one screw and the pointer behaved perfectly again. This hasn't happened since but should it do so I will know where to look first. I don't consider this to be a fault as such:- those plastic screws inside are very sensitive and could easily work loose if the mouse is being used to any degree.

read every single review of the machine and its software that I could find @ and what finally clinched it for me was its ability to offer 4096 colours. Of course, I took other attributes into consideration but computer graphics was highest on my list and if any of you have seen some of the demonstrations you will know what I am talking about.

I sent my cheque off and, on being given a delivery date, took two days off work, enough time to at least get to grips with my new purchase. The Archimedes I had ordered was a 310 Colour System which came in two quite large boxes, one for the monitor and the other containing the keyboard, processor, mouse and manuals. My first impression was how well it had been packaged, sturdy boxes and the obligatory polystyrene foam. The whole system which is very easy to assemble has only one mains plug, very handy for people with limited power points. Unlike my Beeb set up, which has trail sockets plugged into trail sockets.

The whole system looks very impressive with its light cream and grey casing and its neat stylish lines. The keyboard is a little longer than that of the BBC Micro but not as deep and only half the height. I am glad to see that Acorn have kept the now *twelve* function keys. These are still coloured red as on the BBC. The whole look of the keyboard is that of an IBM style with a numeric pad on the right hand side. There is still a function key strip, made of perspex but a lot better because you can actually tilt it forward to suit your requirements.

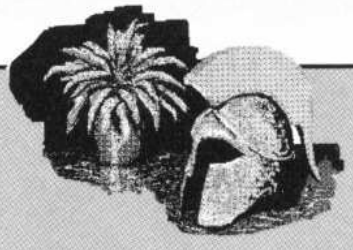
Another nice touch are the adjustable feet at the back of the keyboard unit, as these can be moved to offer three different heights. I like the keyboard a lot, the keys seem to have more of a responsive feel to them than those on the Beeb. That, coupled with the flatter keyboard make typing much more comfortable, I did however, manage to hit some wrong keys early on while trying out my typing skills.

A coiled cable connects the keyboard to the processor unit which also houses a built-in 3.5" disc drive slightly tilted at the front to allow easier insertion of discs. This is where I'm spoilt; only two years earlier I changed from tape to disc, an old Tandon 40 track single sided drive. Now here I was with a drive capable of formatting to 800k. Luxury.

I'm very pleased with the monitor too, a green light on the on/off switch ensures that you know it is on when the computer isn't. I particularly like the flap at the front which houses controls such as centering the picture, brightness and contrast. There is also a button that switches the display to green, useful for word processing. My only niggle so far is that when I placed the monitor on top of the computer unit, the top of it bowed in ever so slightly. I'm not too worried though, as I'm assured that it is strongly made.

Micro mouse

On now to the mouse. This input device is for me what makes the Archimedes so easy to use. Most of us have probably used one of these at some time or other. When *AMX Art* was released for the BBC Micro quite a few of us were tempted to buy the package,



myself included. However, not a great deal of software was available which utilised the mouse.

I seem to recognise the mouse which comes with the Archimedes, it's the same make as the AMX Mk3 which I had the pleasure to make small reproductions of, in my capacity as model maker. The original mouse used a steel ball as the main means of moving the pointer on the screen. This new model has a nicer shape to it, is lighter and uses a nylon ball. I have a very shiny desk top and at first the mouse moved but the pointer didn't. I got round this problem by using a 12" square cork tile I had, left over from a previous DIY job. Believe me, it really makes a very good mouse mat.

Software build-up

Before delivery of my Archimedes, I had bought some blank discs, and a whole range of Archimedes software including, *Artisan*, *Zarch*, *Conqueror* and graphics demonstrations, so should I tire of the 'Welcome Disc' I had something to fall back on. On power up I was presented with the desktop I had read so much about. At this stage I must say that the Welcome Guide became redundant as my plastic rodent scampered about the table top.

The desktop suite is quite ingenious. Icons at the bottom of the screen denote various applications such as notepad, diary, clock etc. Having used this computer for a month now, I can honestly say that I don't have a real need to use these desktop programs. It is nice though, to be able to check the time or do a calculation, although these functions cannot be used from within another program. The one thing it does do is to get you used to using the mouse, and it really is great fun to access the diary and drag it about the screen until it is just where you want it. I have tried positioning the pointer on the month increase arrow and clicking forward hoping to reach January 1989, this doesn't happen, it puts you back at 1988.

As I mentioned before I have been spoilt regarding the built-in disc drive, not only can directories and files be catalogued from the desktop, but they can be replaced, moved and deleted just by clicking selected buttons on the mouse. A lot of the hard work has been taken away with regard to filing system commands and if you're not a programmer and just want to use the software then the Archimedes makes it all so simple.

Mouse control seems so natural now that I wonder how I ever managed without it on some of the programs on the Beeb. I have tried countless drawing and art packages for the BBC B and trying to draw freehand using just cursor keys was laboriously slow. Then along came *Stop Press* which really utilised the mouse.

Big decision

It's decision time again! What am I going to do with my Beeb? Since using the Archimedes the Model B has sat patiently alongside waiting for something to happen, but I'm afraid to say that I just haven't bothered to use it at all. Every thing I can do, I can do better and quicker on the Arc. I don't intend to sell the Beeb though. I will still use the programs I mentioned, that is, until something better comes along for the Archimedes.

I am greatly impressed by the Archimedes and hope that I have imparted that view to those of you who are perhaps thinking of buying one. It's a lot of money I know, but you get a *lot* of computer!

ARTWORK	EXPOSURE	TRANSFER	RESULT
black on white	CPN NEGATIVE PAPER	CPP POSITIVE PAPER	black on white
black on white	CPN NEGATIVE PAPER	CPF 010 POSITIVE FILM	black on clear
black on white	CPRV REVERSAL NEGATIVE FILM	CPP POSITIVE PAPER	white on black
black on white	CPRV REVERSAL NEGATIVE FILM	CPF 010 POSITIVE FILM	clear on black

Peter Clements got the best out of Stop Press but still couldn't resist Artisan!

contex

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BRUCE!

It always amazes me when I look through adverts that there is still a heavy distinction in disk prices. Leaf through the pages and you'll see a price for 40-track single-sided disk, a price for 40-track double-sided and the same again for 80-track disks. I'll let you into a small secret – I can't remember the last time I bought anything other than the bog standard 40-track single-sided format disks – and they always get used in double-sided 80-track disk drives!

So why the price difference? The answer is all about guarantees – a disk sold as being double-sided 80-track has been electronically tested as such before it leaves the factory floor. And if you buy a disk as such and it fails you can get your money back. Many of the brand name disk producers offer a lifetime guarantee to this effect – if your disk goes down they will replace it free of charge. Of course the data on it is still lost...

So, is it worth it? I suppose it all comes down to piece of mind. In six years of excessive disk using I can't ever recall losing a disk – or even a file for that matter – because of a poor quality disk. So as far as I'm concerned the answer is no – but you pays yer money...

While the price of disks seems to be steady at present the dealer prices seem to be creeping up slightly and if the trend continues you can expect to see some price increases in the cheapo disk market in the not too distant future.

If you find that you use large numbers of disks – which can work out expensive – there are a couple of ways of getting space back. If you have a double-sided drive but have been using single-sided disks then be a devil and format side two and double up on your disk files.

Alternatively move over to ADFS format. This is well worth considering and even if you have a BBC B and require a complete upgrade the cost of doing so would pay for itself almost immediately. Typically you can expect to transfer at least three sides of 80-track onto one ADFS disk – and if you are heavy on files it would probably be more as you are not limited to the 31 files limit imposed by DFS.

A step beyond leads to a hard disk and the price of these has plummeted over the last year. Ask anyone who has one and they will tell you they don't know how they managed before hand. But beware – there are some fancy offers for 5 Mb hard disks which are false economy – 5Mb equates to about seven ADFS disks which isn't cost effective. If you treat yourself to one then don't settle for anything less than 20Mb.

● Now I'm not one to sit in front of the television (other than to watch the excellent St.Elsewhere) but my attention was drawn to a recent issue of the *TV Times* which sported an advert from one of the exponents of BBC hardware – *Solidisk*. The ad itself was aimed firmly at the PC world and there's no doubt that if targeted right the sales that such exposure can generate are well worth while. But perhaps not worth the risk. *Gemini* learnt the lesson the hard way and their massive spread in *The Sunday Times* a few years ago proved to be their downfall.

● The autumn months should allow software developers to gain their first sight of Computer Concepts new operating system for the Archimedes – *Impulse*. A brave move from one of the best known names in Beeb computing who are hoping to steal the limelight from Acorns' second attempt at an operating system worthy of the Archimedes – Arthur 2.

Getting wide acceptance of *Impulse* is likely to be one of the most difficult tasks for CC but they seem to be on the right tracks. It will be supplied free with products such as their Archimedes word-processor loading in from disk and switching out Arthur. What's more they will be licensing it free of charge to software developers who want to develop their own software taking advantage of its multitude of features.

Certainly I would envisage *Dabs Press* taking advantage of this particularly in view of the undoubted incompatibility problems that Arthur 2 will herald.

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Dave Reeder

Welcome!

Well, the drought has eased slightly. A few games have slipped through my letterbox this month, but most software companies still seem to be waiting for next month and the PC(W) Show.

What we do have, however, are a couple of mega-previews: the almost legendary *Repoball* (that we seem to have been talking about since last Christmas) and the mega-brill *Bolo* – for this one we even managed to get editor Mark Webb to stay out of the pub long enough to play. Read on.

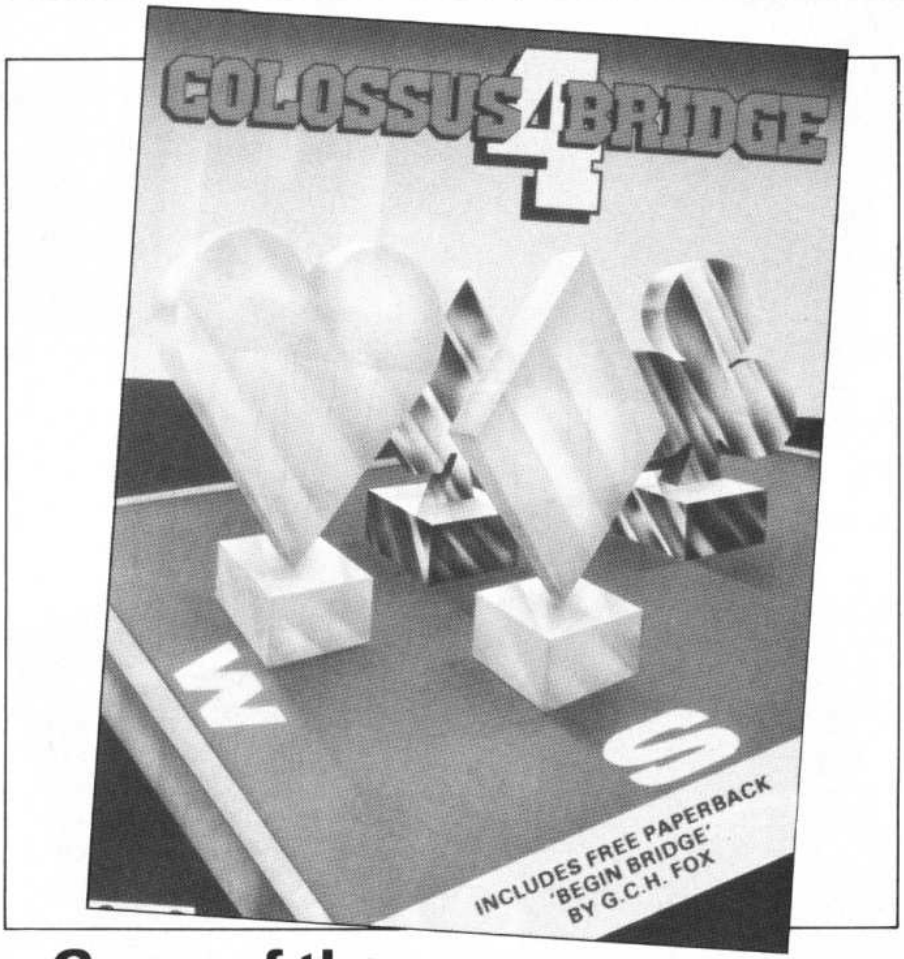
On a more general front, we're still no nearer having a clear picture of the Beeb gamers' future plans. If you recall, I did ask you an issue or two back if you were going to remain loyal to the Beeb or move on to the Archie. On such trivial questions do the entire futures of software houses depend. Do let me know.

And apologies for the confusion. I was under the impression that this was to be the special games issue of A&B. I was wrong. However, next month all will be revealed – loadsa games, loadsa tips, loadsa freelance earnings for me! It's all the fault of this strange dating of magazines – here I am in August writing words that will be dated October, but on sale in September. I think. All very confusing.

Anyway – on with the games!

Re-releases, long-awaited exclusive previews, loadsa tips – it's all here!

THE ARCADE



Game of the month

Colossus 4 Bridge CDS Software Model B/B+/Master/Electron Tape/disc £11.99/14.99

Graphics/sound 7 Playability 8 Originality 8 Options – Value for money 7 Lifespan 8 Overall 8

Let's get something straight right up front – I can't play bridge, I have no desire to play bridge, I'm perfectly content to stay that way. However.

However, this is a package with real class. Anyone who recalls CDS' *Colossus Chess* will know what to expect – fully featured, easy to play but complex, in short a real mind-stretcher.

This has already received a lot of attention for other versions (the usual C64, Spectrum and CPC but also on the IBM PC) – mainly due to the twin delights of a beginner's game that will become as complex as you wish. Imagine this – you against the computer (it plays three hands, the clever little thing), the thrill of the green baize, the raising of bids, trumping and no trumping, and all the time you're learning. Crafty but fun.

The game plays the Acol system, incorporating three popular conventions (Blackwood, Stayman and Baron), all of which begins to make more sense after you've read the free paperback included in the packaging – Fox's 'Begin Bridge'. It seems that all the stuff at the beginning of a game – you know, four hearts, two no trumps and the rest – is a kind of code. At times it represents the actual number of tricks you think you'll win, at others it is just a way of telling your partner the precise cards you have in your hand. Of course, if it's a convention then you must also be telling the other players, I guess. Anyway that hardly matters as the computer knows your hand – heh, heh!

What the game will teach you, however, is how to play. It includes a nifty little tutor that takes you through ten sample hands, ensuring that you learn the best way to bid. Once you've had a shot at that and skim read the book, it's time to play.

The graphics are clear, cards suitably large, and the computer's response very fast indeed. Your own cards are displayed (you always play South) and it is quite unforgiving. Unfortunately all the goodies promised in the booklet do not appear on the Beeb versions – nice things like autoplay, demonstrations, backstepping tricks and so on. Even so, it is quite superior to any other card game simulation I can recall for the Beeb.

If you are a bridge addict, then this is obviously for you. If you're keen to learn, then the same applies. However, if you just have a passing interest, then I think the price would put you off. However, it is worth it – this is a game that will serve you in good stead for years. Well done, CDS.

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SHIELDS
2
GAME PAUSED
1 WAVE

Darts

Blue Ribbon/CDS Model B/Electron Tape £1.99

Graphics/sound 6 Playability 6 Originality 6 Options 1/2 player Value for money 6 Lifespan 5 Overall 5

What is it with games this month – is there no end to the sport simulations? Here's another reissue, though I can't recall at present if this was the original title.

Usual darts games available here – 501, round the board and cricket – but although the graphics are colourful and clear, there is something missing. Maybe it's a sense of excitement, maybe darts is not ideal computer fodder – I remember a similar problem with a Tynesoft darts simulation in *Indoor Sports*. That said, it's adequate enough and, although it won't excite you beyond words, it's quite fun. In its limited way, of course.

Dead Or Alive

Alternative Software Model B/Electron Tape £1.99

Graphics/sound 5 Playability 4 Originality 4 Options – Value for money 5 Lifespan 4 Overall 5

I'm afraid the title just about sums up this reissue from Alternative – a poor, 'shoot up Dodge City' clone. If your idea of fun is shooting the baddies as they appear all over a minimally drawn Western town, then this is one for you.

I think the rest of us will pass it by. Or shoot it like the dog it is.

Golf

Blue Ribbon/CDS Model B/Electron Tape £1.99

Graphics/sound 5 Playability 6 Originality 6 Options – Value for money 8 Lifespan 6 Overall 6

This is an old favourite – reviewed here before as *Birdie Barrage* – already seen as full price and budget. If you haven't already got a copy, then this could be the time.

The game itself is about as exciting as you would expect a golf simulation would be – a fair bit of skill required to choose the right club, judge the wind and distance, and keep out of the clubhouse and the dream of a drink at the end of the 18 holes. It's not easy to play, mainly because of the lack of precision needed, but it does offer (especially in this budget release) a pleasant way to pass a few hours.

Full marks to Blue Ribbon for clearly marking this as a rerelease – so many budget games do their best to hide it.

Round Ones

Alternative Software Model B/Electron Tape £1.99

Graphics/sound 8 Playability 7 Originality 6 Options – Value for money 7 Lifespan 6 Overall 7

Here's just what the world needs – not a load of old balls, but a cut down, budget version of *Arkanoid*. Of course, it misses many of the features, but the basic idea is just the same. Loads of screens (loaded in blocks of eight) and a ball that you control by hitting it with a bat. Hit it properly and slowly destroy the pattern of bricks on the screen.

Again, in common with full price versions of the game, there are bonuses which can be caught for good or bad effect and, a new touch I think, an optional force field which protects you from the meanies which roam down the screen looking for trouble.

This isn't going to end the market for proper versions of the game, but it's a great pocket money version and should at least show you whether you find the concept fun enough to spend four times its cheap price. If only there were more budget games like this!

Cheater

Remember that fun little game *Saracoid* by Dean Lester which appeared on ASL's *Power Pack 2*? Seems that Leeds' John McIver does. More than that, he found the cheat mode. Just press G and L on the first title screen and then input a screen number from 1-30 when prompted.

Hints 'n' Tips Secret Passage

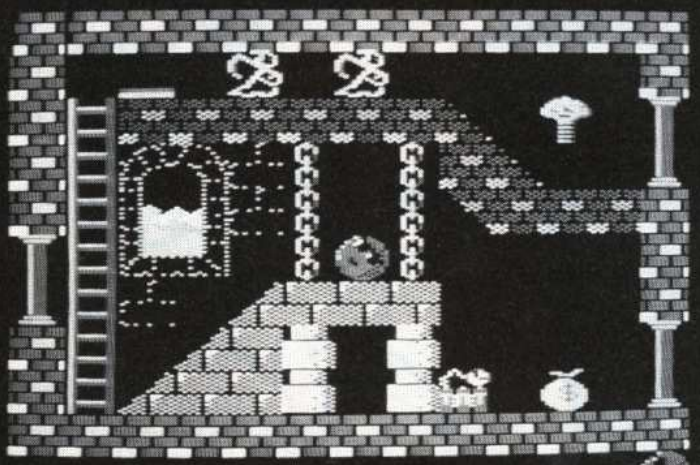
Stephen Goodwin from Australia (Where? Okay, Scullin in Australia – any clearer now?) has found an interesting way out of the difficult Heathrow screen in *Spycat*. Go to the room to the right and jump off the desk to the right – tricky, but keep trying. You end up in a room which allows you to get back to the main game area.

Preview Time: 1

This one is just a tease for the future. Somewhere on these pages you should find a screen shot froma game under development called *Acropolis*, starring yet another cute squishy ball, this time called Sprat.

Supposedly an arcade adventure with 360 screens (loading as four lots of 90 screens, each block a different game), it will involve the usual collecting and using of objects. And that's about all I know, apart from the fact that it has a team of coders from Shaftesbury, all with suitably bizarre names like The Puffin and Lauderdale.

I'm indebted to to David Williams for these snippets – he's part of the team but is not saying what his role is. Or what dumb name he's chosen. Good luck, anyway – it looks intriguing.



Preview Time: 2

We've read about it here (endlessly), I've talked to the programmer about it (endlessly) and now, at last, I've had the chance to play an 'almost finished, honest' version of John Mackay's *Repoball*. Was it worth the wait?

I'm not sure. It's certainly fun, but there still seems to be quite a lot of work to do – the on-screen score, for instance, has a nasty habit of moving round the screen at times, especially when a new score should have removed it.

The idea is simple – you control a ball on a moon's surface and must shoot various baddies in order to replenish a supply of isotopes. Feed the correct number into the reactor and you can leave for the next moon. After six moons, you get to move on to the mothership and other goodies (not present on my version).

The graphics are fun, the baddies' movement is smooth but, somehow, not much happens. Each moon surface is covered with odd structures that I kept expecting to contain bonuses or vicious cannons that would

ARCADE

♦ LISTING 1 ♦

```
 10REM PLAN B
 20REM New Colours
 30REM    &
 40REM  Infinite
 50REM Everything
 60REM By Steve Goodwin
 70FOR pass=0TO3 STEP3
 80P%=&380
 90[
100OPT pass
110PHP
120PHA
130TYA
140PHA
150TXA
160PHA
170LDA #9:STA&F:STA&10:STA&11
180LDA #&30:STA&5:STA&4
190LDX #table MOD 256
200LDY #table DIV 256
210LDA #&C
220JSR &FFF1
230LDX #table2 MOD 256
240LDY #table2 DIV 256
250LDA #&C
260JSR &FFF1
270PLA
280TAX
290PLA
300TAY
310PLA
320PLP
330RTS
340.table
350EQUB 0
360EQUB 4
370EQUB 0
380EQUB 0
390EQUB 0
400.table2
410EQUB 1
420EQUB 6
430EQUB 0
440EQUB 0
450EQUB 0
460]
470NEXT
480?&220=&80
490?&221=3
500*FX14,4
```

Also Seen

Seen in the shops, that is. Not everybody sends me copies of everything but I thought you should know anyway that there's now a budget version of *Way of the exploding fist*, the greatly enjoyable karate game and a full price release from Anco – *Strip Poker II Plus*. This one looks very tacky – seek it out if you must.

Also available by the time you read this is the new Tynesoft sports simulation – *Summer Olympiad* – a tie-in, of course, with a few weeks of straining bodies in Korea. Whether this will be Tynesoft's Seoul (ouch!) sports release for the rest of the year we'll have to see, but advance screen shots suggest that it is up to their usual standard with five events to play – fencing, skeet shooting, diving, triple jump and hurdling. If it goes on like this, there won't be any games left to simulate on the Beeb, though I do wish someone would bring out a really good sailing simulation.

And maybe available by the time you read this, maybe not, is the expected Beeb version of *Helter Skelter*, already released for the Amiga by Audiogenic. What's it about? It's not an interactive Charles Manson game (current affairs time, kiddies), but a platform game involving a monster-crushing ball. Sounds almost too intellectual for me!

Plan B, Again

Just can't stop those *Plan B* cheats coming in – sign of a popular game, I believe. This one's from Stephen Goodwin. Just save *Listing 1* and then run it before chaining the first part of the game. Then you can play the game in colour as well as having infinite energy, infinite ammo and all keys.

try to blast me from the sky – no such luck.

It certainly shows skill but, sadly, not too much gameplay – rather reminiscent of Peter Scott's *Ransack* as well, but without the extra detail and excitement. Maybe I need to play the full version – it's currently with a number of software houses for evaluation. I'll keep you informed of progress.

It's Anarchy

Didn't seem to get much publicity but it seems that I'm not alone in really enjoying Atlantis' budget game *Anarchy Zone*. Here, thanks to Dugald Holmes from Epsom, are the codes for the 32 levels of the game:

1 – (anything); 2 – WATT; 3 – EASY; 4 – DUNE; 5 – TACK; 6 – BILL; 7 – BURP; 8 – BAIT; 9 – WICK; 10 – JILT; 11 – SILK; 12 – CULT; 13 – POLE; 14 – NERD; 15 – PALL; 16 – FEND; 17 – CITY; 18 – TRIO; 19 – FLEX; 20 – LOBE; 21 – DAZE; 22 – LOSS; 23 – DUNG; 24 – FACE; 25 – WRAP; 26 – SE15; 27 – KELP; 28 – RENT; 29 – MOLE; 30 – DUEL; 31 – BABE; 32 – DUDE.

And, contrary to the claimed 32 screens, you can then enter several screens of free-space: code <AD>.

Wait A Minute

Final words from Stephen Goodwin this issue (I promise) bring you a pause facility for most games – especially *Tetris*, according to Stephen. Just save *Listing 2* and then run it before loading the game – delete key pauses, copy key restarts the game.

♦ LISTING 1 ♦

```
 10REM Pause Key
 20REM  Utility
 30REM
 40REM Pause - delete
 50REM Unpause - copy
 60REM By Stephen Goodwin
 70FOR pass=0TO3 STEP3
 80P%=&380
 90[
100OPT pass
110PHA
120PHP
130TYA
140PHA
150TXA
160PHA
170LDA #&81
180LDX #&A6
190LDY #&FF
200JSR &FFF4
210CPX #&FF
220BNE out
230.loop
240LDA #&81
250LDX #&96
260LDY #&FF
270JSR &FFF4
280CPX #&FF
290BNE loop
300.out
310PLA
320TAX
330PLA
340TAY
350PLP
360PLA
370RTS
380]
390NEXT
400?&220=&80:?&221=&3
410*FX14,4
```

Archie Corner

One of the most frequent requests here at The Arcade is to enlarge it to include every Acorn machine known to man – you know what I mean: Elk, B+, 128, Master, Compact, Torch, Archie, Z88. Z88? Readers, I would love to but I'm awfully attached to my trusty old issue 7 Beeb and, more importantly, where would I keep all those machines I can't afford?

Still, at times we throw the odd crumb of comfort to those outside a strict Model B world. case in point – here are some tips and cheats for Minerva's Archie game *Hoverbod* from Isleworth's William Charles.

There are, apparently, numerous built-in cheat modes. Firstly, during the initial eight screens you can freeze all the monsters (hold down: keypad, /, both shift keys) or shift into the main game (hold down: keypad, *, both shift keys).

Once in the main game you can get an everlasting spray-can to combat the fungus (hold down: keypad /, both shift keys) or go straight to the final congratulatory message (hold down: keypad *, both shift keys).

Lastly, the passwords to those initial eight screens:

1 – (anything);
2 – MINERVAS;
3 – SIRBARRY;
4 – ZOTYBLOB;
5 – FLUMPIES;
6 – SQUIDGEE;
7 – WOBBLIES;
8 – PASSKETT (might be POSSKETT – the writing is unclear).

Here's Sharkie!

Seems I was so nice about Sam Inglis' *Shark* that's he's written to share a thought or two with us.

Firstly, the built-in cheat mode: on the title page, hold down shift-lock and type FUGAZI. This gets you 20 lives and loadsa bonuses. Secondly, any idea what Shark should stand for? No, neither had I – Suicidal, Homicidal and Ruthless Killer. Nice touch.

And, still on the game, Nicholas Davey from Wilts sends a neato tip – when enemy soldiers approach, just duck and their bullets go over your head. That's not a tip, Nicholas – that's a survival technique.

Easy Poke

Over the last year, The Arcade has included a number of easy poke values to be inputted into Mark Gidley's Easy Poke program. Judging by your enthusiasm, this has been very popular but, until now, Master owners have been unable to use it.

Why? Because, as Richard Koten from Harrow points out, the Master has a different address for the OS interrupt handler than that used in the program (the JMP &DC93 in Easy Poke). The solution? Easy – just delete line 80, change 93 to FF in line 210 and DC to E5 in line 220.

And Finally...

And finally we stumble to the end of yet another Arcade. Yet month, please remember, is the special games issue of A&B Computing – miss it at your peril.

And, because that is likely to clear out my stock of tips, pokes, maps and who knows what else, this would be a very good time to share your hints 'n' tips with the rest of The Arcade's readership. Just send 'em to me at:

Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB.

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AUSTRALIA: WHAT'S HAPPENING

If you think the BBC Micro is confined to schools in the United Kingdom, you're very wrong. Since the days of the earliest BBC Model A, Australian schools have been using Acorn micros. In fact, there's over 10,000 BBC Model Bs, B+s, Master 128s and Compacts to be found here. That's not bad for a country of only 16 million people

For many years we've had the best of both worlds in Australia – access to the best of the software and information coming out of the United Kingdom and a healthy supply of our own. There's a huge range of resources in Australia which until now has probably been unheard of by most teachers in the UK.

Now, *A&B Computing*, in its wisdom, has decided to give Australia a chance to have its say. We hope to use this page to keep you up to date with interesting activities going on in Australian schools and to let you know about Australian software and other resources which might have a place in UK classrooms.

This month we'll also give you a brief description about the state of educational computing in Australia. Australia is divided into six states and two terrritories. Each of these bodies has an education department that is responsible for computing in schools. These state education departments perform some similar functions as LEAs in the United Kingdom. They make recommendations about hardware, provide consultancy advice, produce resource materials and, in some cases, develop software. At present, the BBC Compact and/or the master 128 is recommended by all states and one territory. The Archimedes is also recommended in Western Australia and is currently under consideration by several other states. That means the BBC has a considerable presence.

The Queensland, South Australian, Tasmanian and Western Australian Education Departments all develop software. You may be familiar with some of it. *Desk△Top*, from South Australia, is an integrated package which is sold in the UK. *Settlement and Mapping Skills*, from Tasmania, are currently available from ESM. These are just the tip of the iceberg though. There are also a few private software houses. Some, like Jacaranda, already distribute their software in the United Kingdom. *Dinosaur Discovery*, for example, is distributed by 4Mation Educational Resources. The largest company, Softime, has many titles that would be of interest to teachers in the UK. We'll be reviewing the best new Australian packages in these pages and also letting you know about older titles you may not be familiar with.

Be aware though that in Australia, virtually nobody uses 40 track disc drives. This means that if you order any Australian software you will need to specify in you want it on a 40 track disc. Australian publishers assume 80 track unless you tell them otherwise. In some cases it may not be possible to supply a 40 track version. One of the reasons Australians decided to stay almost exclusively with an 80 track disc drive right from the early days was because of the extra storage capacity. Many publishers have exploited this and so some software just won't fit on a 40 track disc. If you're ordering a 3.5" version of a package for the Compact there won't be any problems of course.

There is good news for Econet users, though. Australia is very advanced in terms of its Econet usage and has been for many years. As a result, many suppliers produce Econet versions of their titles as a matter of course. Econet schools in the UK may find Australia a rich source of software.

Silicon Voyager

This excellent package has been available in Australia since 1984. Published by Softime, it has been widely used in lower to mid-secondary classes investigating astronomy and even in the upper primary school. Its contents are as relevant for students in the United Kingdom as they are here in Australia.

Students can travel around the solar system learning about different planets and their moons. The important features of each planet are explained in tutorials illustrated with appropriate graphics. These graphic images are superb. They are high resolution and show extraordinary detail. Other features of planets can be discovered using simulations. For example, you can drop a probe from above Venus and investigate the relationship between altitude, temperature and pressure. You can use the simulation of the moon's orbit as an exercise in getting students to predict what the moon might look like from Earth at any time. You can view a simulation of the orbits of Neptune and Pluto and observe when Neptune is the furthest planet from the sun and why.

Silicon Voyager can be used in many ways. Small groups can work together to find specific information. Alternatively, if you have access to just one computer and a large screen, you can use it as a superb electronic blackboard. Many of the simulations are invaluable in explaining concepts which are difficult to describe in other ways.

Silicon Voyager is available from Softime, 19 Cato St, Hawthorn East, Victoria, 3123. The DFS and ADFS version costs $49 Aust. (It includes a 5.25" and 3.5" disc.) The Econet version costs $54 Aust. Include $10 for airmail postage.

Some Australian Resources

As well as software, there is a wealth of support material available in Australia.

Teaching Suggestions for Using Podd in Special Education, written by Anne Williams, is full of ideas for getting the most from *Podd*. It includes suggestions for activities that will help children with reading and language difficulties, severely handicapped children, children with intellectual disabilities, and children with perception problems. Many of Anne's suggestions are also appropriate in infant classrooms too. The booklet costs $10.35 including airmail postage and is available from the Curriculum Resources Section, Education Department of Tasmania, 252 Argyle St, Hobart, Tasmania, 7000. Some people may be familiar with Anne's work. She and her husband Ray produced the Melogo programs which are now available in the Blue File collection.

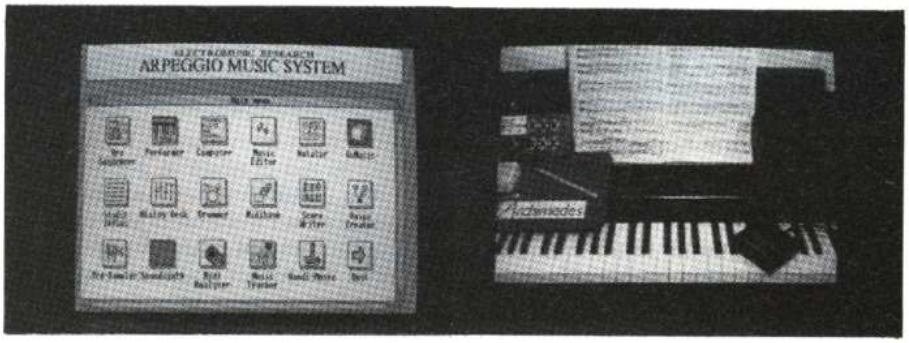
Also from the Tasmanian Education Department (the same address) is the magazine *Classroom Computing*. Published three times a year, it is full of practical classroom activities for both primary and secondary schools and also has interesting general articles. The most recent issue, for example, includes an article about a classroom project based around *Police – Language in Evidence*, a description of an electronic mail project between children in a primary and a special school and a lengthy paper describing some exciting quantitative research about the effects of the use of particular types of software on children's language development. An overseas airmail subscription to *Classroom Computing* costs $25 Aust a year.

Acorn products are distributed in Australia by local company, Barson Computers. Barsons are heavily committed to the BBC product range and have recently embarked on a major program to provide curriculum support for schools. They have just published two books; *Computers in Primary Schools* and *Computers in Social Science* which include details of exemplary software (both Australian and British) as well as teaching strategies. Forthcoming titles in this series are *Computers in Special Education and Computers in Mathematics*. It's hoped these books will be available in the United Kingdom soon as many of the ideas are just as applicable in the northern hemisphere. The first two are, however, currently available from Barson Computers, 335 Johnston St, Abbotsford, Victoria, 3067 and cost $10 each, including airmail postage.

PS

Don't forget that it's easy to organise a bank draft in Australian dollars at your local bank. The fact that Australia is on the other side of the globe and uses a different currency shouldn't discourage you from getting hold of material published here which you think might be useful. Australian teachers have been getting the best of your software for years!!

Sue Dyson and Roger McShane, collectively *The Quill Consultancy* are experts in educational software. Their column, *Australia: What's happening* will appear regularly in *A&B Computing*.



WHAT'S NEW

What's New EMR? Darrin Williamson has an exclusive preview of the latest MIDI offerings from Electromusic Research

Darrin Williamson

If any of you thought that you should start looking around for another brand of computer for your music needs (you know, the ones our rivals advertise!) take heart. Companies such as EMR (one of the first on the market with computer-based MIDI software) have not only kept on selling those products for the beeb but have been improving them and adding to the range as I saw when I went down to their Essex offices where I was shown all the latest programs for both eight and 32 bit systems.

Watch out Tramiel!

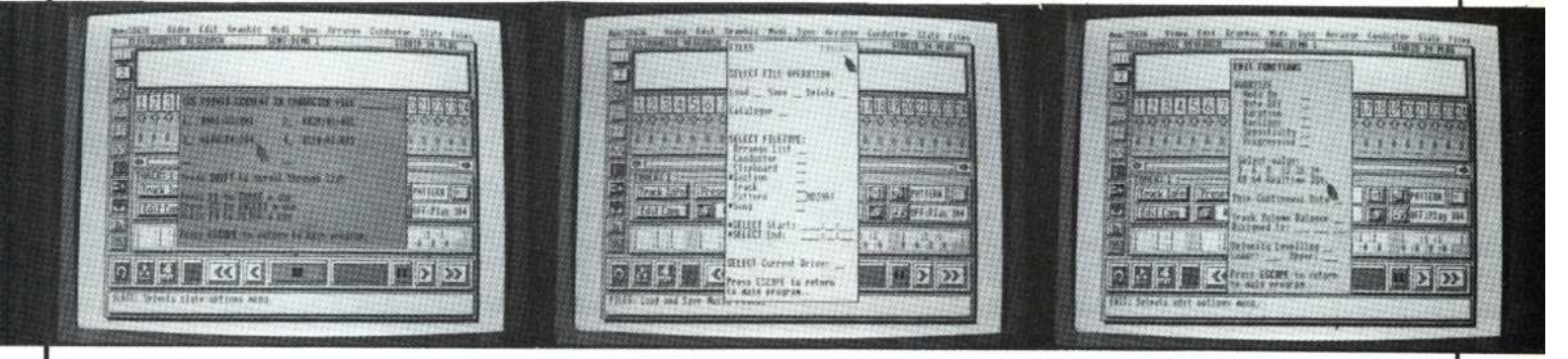
It looks like the Arc is set to rock the very foundations of the music empire created by the Atari ST and the IBM PC with its true multi-tasking capabilities and superior processing speed. The first evidence of this was the Soundsynth package which I looked at back in June that was not only a useful stand-alone waveform editing package but also one element of the Arpeggio music system which will build up to become a complete music workstation.

The package bound to cause the most interest out of these is the Studio 24 plus which, as Mike Beecher freely admits, takes the best features of the best sequencers and puts them altogether in one package along with a few improvements of his own. If that were not enough to knock your socks off then the price of £99.00 may well do the trick.

As the pictures show, 24 plus is probably the most ambitious, certainly the most professional looking package that EMR have so far produced. All those critics in the past, and I have to admit I was one of them, who found some of the Beeb packages somewhat long-winded and unflexible will find no such faults with this. All your options are clearly visible on-screen and moving around the package is no harder than using a multi-track tape recorder. However you can do an awful lot more with this than you can with mere magnetic tape.

For a start the editing facilities are second to none. As with most good sequencers you can alter individual notes (altering pitch, duration velocity, volume etc) but this one also generates SMPTE codes which makes this very useful for anyone involved in film or video production work as a composition can be synchronized to an existing soundtrack on film or tape and edited alongside before anything is laid down for good. Even if you don't intend to be the next Jan Hammer SMPTE is invaluable if you are syncing your MIDI sequences to tape. One track can be striped with SMPTE codes which drive the sequencer. The remaining audio tracks can be used for acoustic instruments or vocals. Several companies market a piece of hardware to do this job but this is the first time somebody has produced a sequencer with these features for this price.

With this degree of real-time control, precise drop-ins can be achieved. This proves very useful if, for instance, you wish to correct a bassline in your chorus. The precise start and finish points can be entered the sequencer will drop in and out of record at just the points you want to correct. Furthermore you can loop between those points whilst still in record which allows you to continuously overdub on a single track which



is quite handy if you have something like a Roland MT-32 or a D-110 which sport a Rhythm section consisting of around 30 sounds on a single MIDI channel. You can loop through the selected section continually overdubbing with new sounds rather than recording the individual sounds onto different sequencer tracks and then bouncing them down onto one afterwards.

Twenty Four Today?

As the title suggests you have at your disposal 24 individual sequencer tracks to lay and record on which means that you can use up all 16 MIDI channels and have eight left to either put in alternative sequences or use them with some internal sounds like the ones created using Soundsynth. That way you can use all 24 track at the same time and create a real "wall of sound" with as may tracks at your disposal as most professional sound studios.

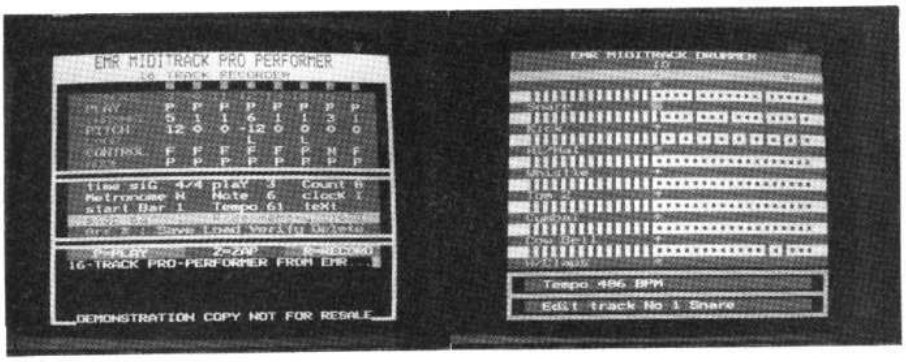
And that's not all. 24 plus also supports MINI (Musical Instrument Networking Interface) which with a couple of grands worth of additional hardware will give you over 8000 individual channels of MIDI communication, which should be enough for even the most complex of set-ups.

Studio 24 Plus should be available during October. Stay tuned for a full review in the next couple of months.

And the Rest!

Arpeggio hasn't just confined itself to the world of MIDI. EMR do seem to recognise and colleges and have come up with a package that combines EMRs MIDI programming skills with frames grabbed with the aid of Watford Electronics video digitiser. Music Teacher is an on-going course of music tuition which uses digitised pictures to show exactly what you should be doing. As the pictures show. Chords are shown on the screen while MIDI codes are sent out via the podule so you here the sound your keyboard makes in relation to what you see on the screen. The program recognises what note you press on your instrument and continues if you got it right. Several packages are planned with this approach so keep on the lookout for more like this.

The rest of the Arpeggio System is still under development but the plans are there. Firstly most of the existing packages for the beeb will be ported across such as Composer, Performer, Notator, Music Editor, Vu-Music, Drummer and Handi-music. New Elements in the pipeline include Midi bank- a generic librarian package for storing system exclusive MIDI data like Synth patches, Drum patterns, performance data, etc. In a similar vein is Voice Creator which takes all the hassle out of creating new voices for your synth. Finally we have MIDI Analyser which graphically monitors and allows you to alter MIDI information going to and from the units in your set-up.



What about the Beeb?

Relax everyone you've not been left out there is also some exciting developments on the Model B front. For a start there is Pro Performer which features all the functions of its predecessor but now has sixteen tracks instead of eight and is packaged in sideways ROM format. Price £70.

Next we have Drummer which turns you beeb into a very easy to use Drum Machine front end. You can assign what keys on the keyboard correspond to what sounds, build up a pattern from the keyboard (musical or QWERTY) and either run it as it stand or merge it as one track on any of the EMR sequencers.

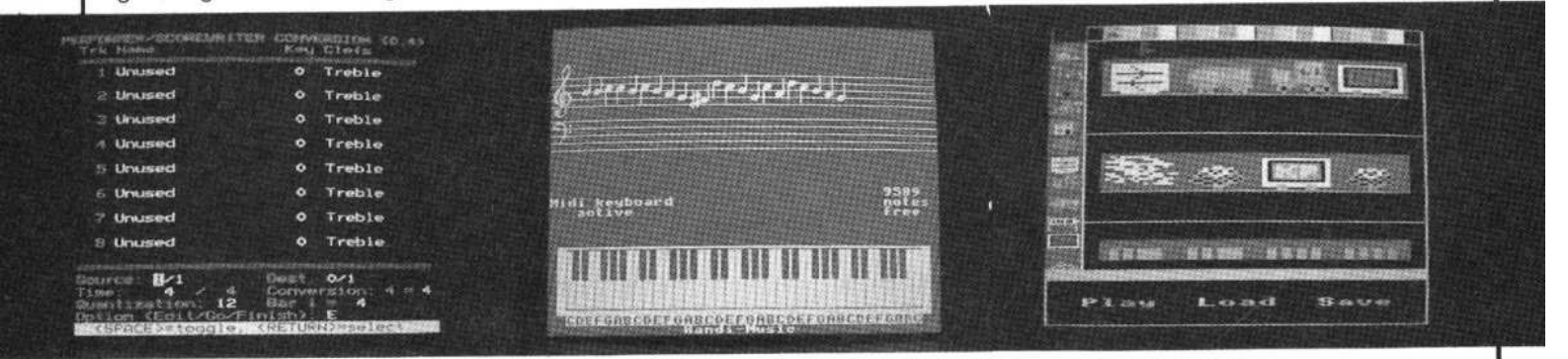
Scorewriter- the stave music processor has been given a new utility disk. In addition to being able to transfer music to performer you can now convert track composed using performer into traditional music notation which will prove invaluable to MIDIphiles who have friends who need to read "proper" music. Scorewriter is supplied on two ROM and cost £150. Utility Disks cost £20 for Scorewriter to Performer, £40 for the other direction.

Next we have Handi Music. This is yet another sequencer package but this one is designed with handicapped people in mind thanks to its one button entry system. Price £30.

Primary school teacher may well be interested in the first MIDI package for the under 11s. Picture Music uses graphics to represent notes making the whole process more approachable. Price £30

On the voice editor front the latest addition is the MT-32 Editor which, for £40 allow access to all thos little nooks and crannies of this marvellous expander that you can't even get at with a cotton bud (thanks Max)!

As you can see the Beeb is certainly not dead as far as music software goes. I have mentioned a large number of packages here and A&B will review them as working version become available to us. As for the Arc, well, it would seem that the skies the limit!



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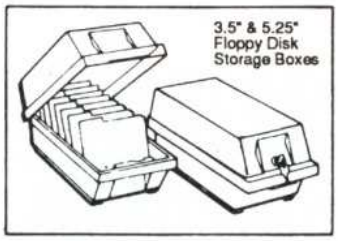

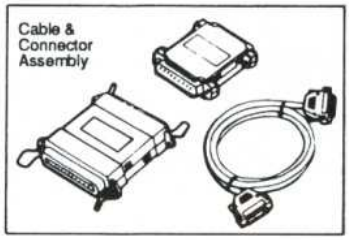

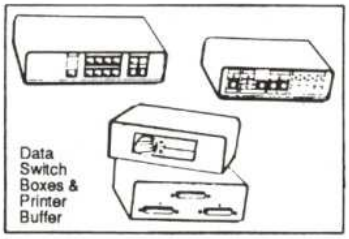

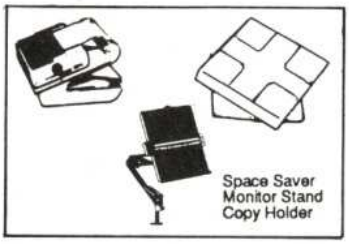

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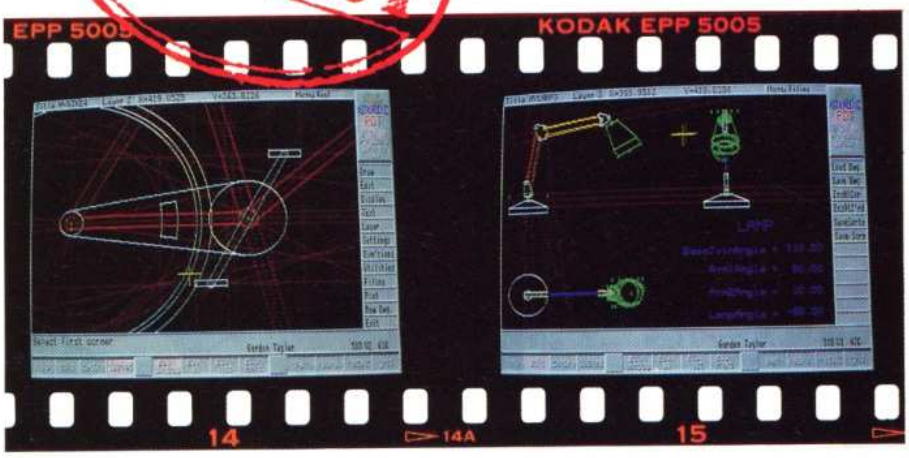
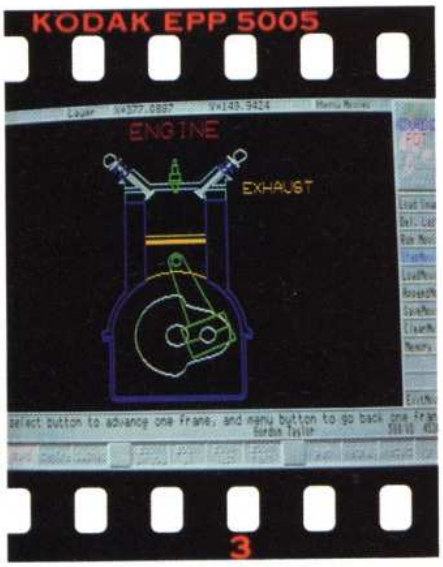
Archimedes REPORT

Acorn's Arc reaches maturity with Oak Professional Software – and the world's first fully interactive, fully parametric CAD package





Introduction

Computer Aided Design (CAD) has many advantages over manual draughting, and has been widely adopted – though it is still far from universal. Rather like word processing, it offers many advantages, such as ease of editing, and producing "clean" plotted drawings. Interactive parametric CAD offers many further advantages, such as designing families of parts without entering more data, and "What if ?" simulation studies. The Oak "Parametric Design Tool" (PDT) is believed to be the world's first fully interactive, fully parametric CAD package at any price. It is also unique in being able to produce animations of drawings, such as linkages, which can run smoothly on-screen in real time.

Setting Up

PDT will run on an Arc 310 or 440. It can run with only a single floppy drive, and can make use of a hard disc. It can also benefit from a Computer Concepts ROM/RAM board, acting as a RAM disc. PDT comes with installation files for both floppy disc and hard disc systems. It runs in Mode 12 with a standard colour monitor, and comes with an alternative palette to suit the grey tones possible with a standard monochrome monitor. When a multi-frequency monitor is connected (and configured), PDT will also run in Mode 20, but it does not support the high-res mono Mode 22 that may be used with 400 Series machines.

As a large application, holding all of its data in RAM, PDT benefits appreciably from correct configuration of the machine. This is done by one of four BASIC RUN files, which also restore the previous machine configuration before loading PDT. The maximum space for drawing data is given by CADFLICK, which starts it up in Mode 12, but with only one screen bank, which means that "Movies" will flicker. The default is named CAD, and starts up PDT in Mode 12, with two screen banks. This means that "Movies" do not flicker, but the space for drawing data is reduced by 80k. Similarly, CAD20-FLICK starts up PDT in Mode 20 with one screen bank. Although the screen RAM required is no greater, the program sprites are twice the size, and take another 80k. Likewise, CAD20 starts up PDT in Mode 20 with two screen banks. This increases the space required by 160k, which means it will not run on a 310. The operating condition may be changed from the default by putting the name of the appropriate RUN file in the !BOOT file.

In Use

The main screen has a smart, precise appearance – even in Mode 12. This is partly due to the use of a text font which is finer – and sometimes narrower – than the standard one. The layout is identical, but the vertical resolution is doubled, in Mode 20 – in which the Arc looks more like a workstation. The features of PDT are compared with those of two other drawing/CAD packages in Fig. 1.

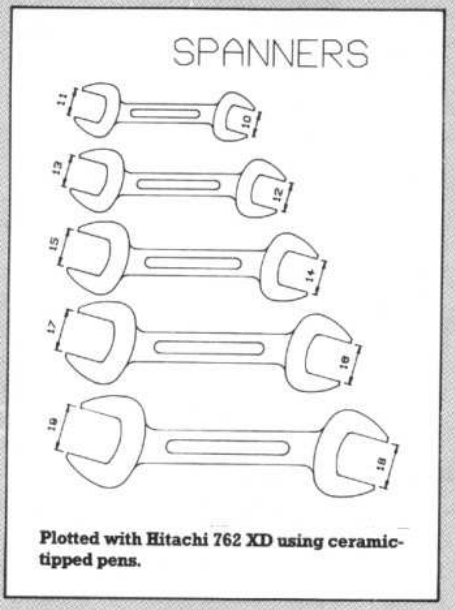
For PDT, the theoretical maximum number of objects is over 4000 million, but this is limited in practice by the available RAM. Even in a 310, PDT starts with up to 108k free for parametric data, which is enough to hold three copies of the well-known "Shuttle" drawing – with room to spare. In a 440, with more than 3Mb of

RAM free in total, 1132k is available for parametric data – over 10 times as much. The memory free (in k) is displayed continuously. In addition, the menu option "Memory" returns the number of objects in the drawing, and the memory used and memory free (in bytes).

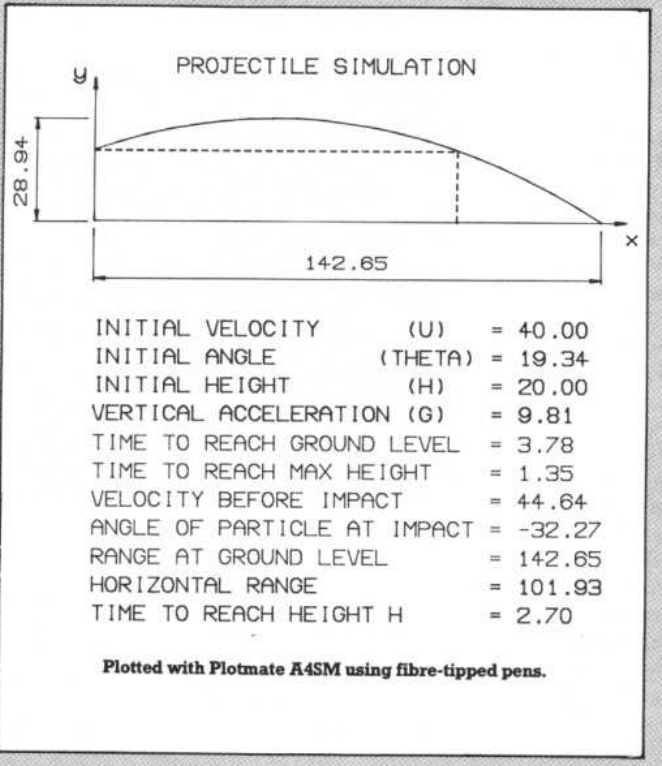
PDT is, in general, mouse driven – both for positioning the cursor, and for selecting from the menus. (A future release of PDT will support use of a digitiser pad – both for cursor control, and for command "picking"). The menu map of PDT is shown (in part) in Fig. 2, with some of the options followed by the number of entries in sub-menus. The appearance of the menus is similar to conventional CAD packages, like TurboCAD and AutoCAD, with words, as for most PC applications, rather than icons, as for most Mac applications.

The current menu is retained on screen, which is faster than using pull-down menus (like AutoSketch) – especially when commands are repeated – but they cannot be selected from the keyboard. You enter the options by clicking on them with the Select button, and can go back up one level of menu by clicking with the Adjust button on the menu area (or by pressing Escape). You can also return directly to the "root" or main menu by clicking on the Oak logo at the top right of the screen. In addition, 12 commands are available on function keys, which allows them to be used "in the middle of" other operations. The function keys are labelled with a strip at the bottom of the screen – with each being highlighted in pink when they are enabled. When the on-line help facility is enabled, this area is used to display context-sensitive help messages. Configuring PDT without the on-line help leaves some 16k more free for drawing data.

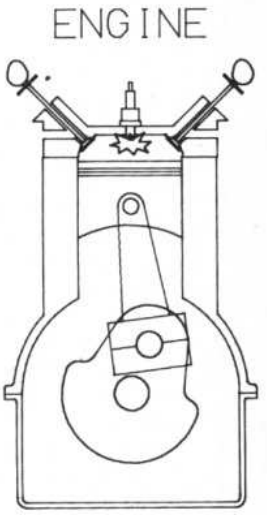
Although the X and Y co-ordinates of the cursor are displayed to only seven significant figures for clarity, PDT works internally to 16 significant figures for accuracy. This corresponds to the IEEE extended precision floating point standard, so PDT requires either a Floating Point Emulator or – on 400 Series machines – a hardware Floating Point Unit. Due to the size of the numeric range, the drawing units can be regarded as any (single) units you like (mm, feet, km, miles etc), but not mixed (eg feet and inches). The drawing area has the correct proportions (root 2 to 1) for "A" paper sizes. To fit the drawing onto the A5 to A0 paper sizes, a scaling factor may be introduced when plotting. The screen background colour is fixed as black – so the display is light on dark (which Oak consider to be preferable). However, the colours of all the objects in the drawing may be set by the user.



Plotted with Hitachi 762 XD using ceramic-tipped pens.



Plotted with Plotmate A4SM using fibre-tipped pens.



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Data Format

While many (but by no means all) CAD packages have "associative dimensioning", in a parametric drawing all the objects are associated, even after editing. Some "parametric" CAD packages are language-based, and some have only parametric points, but PDT is fully interactive, and fully parametric. Thus the definitions of all objects are associated – including those drawn using geometric constructions. In PDT, a drawing is held in three forms at once – a parametric definition buffer, a results buffer (containing ordinary co-ordinates, to speed drawing the display), and a symbol lookup table which links the two. Since the results buffer alone is about the size of an AutoCAD drawing, the overall space taken is several times as large. However, the capacity of PDT, even on a 310, is ample in practice, and fewer drawings are needed for a family of parts.

In the context of CAD, "parametric" also implies the use of labels for variables, and expressions in place of values. Similar in some ways to a spreadsheet. While it normally displays only results or values, all the variables in a drawing can be defined by formulae or expressions. There are the usual trigonometric and logarithmic functions, together with ROUND() and TRUNC(), and the operators DIV and MOD.

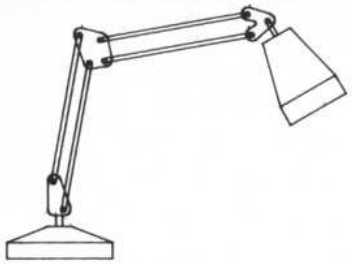
Because it can evaluate expressions, PDT has no need of an on-screen calculator. You can change the definitions of variables from numeric values to expressions and back again. Reasons for changing from a value to an expression might be to embody some rule of proportion dictated by design (stress or appearance), or manufacture (such as rationalisation).

Variables in PDT may also be named with labels ("Scalars"), which make editing much easier. A Scalar is like a BASIC variable, and must be defined in terms of values, functions, and other known variables. To identify which Scalar names are associated with which objects, it is best to choose meaningful names. There can be up to 30 Scalars, each with names of up to 15 characters. You can change the variables from un-named to named and back again whenever you wish, (and you can delete any unwanted names).

Display

All CAD packages have a "Redraw" function, to tidy the screen, and to update it to the drawing data. In PDT, "Redraw" only recalculates those objects which have been changed since the last redraw, whereas "Recalc" recalculates all the objects, and then redraws.

"Redraw" applies only to those objects currently within the on-screen drawing area, but when panned or zoomed, as well as the redraw, any necessary recalculation is done. As with a spreadsheet, you can turn off the Auto Recalc (though this would only be necessary for a very large drawing), and a message is displayed. "Redraw" and "Recalc" may still be



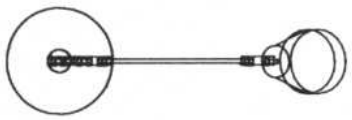
LAMP·

BaseJoinAngle = 110.00

Arm1Angle = 80.00

Arm2Angle = 10.00

LampAngle = -60.00



Plotted with Plotmate A4SM using fibre-tipped pens.

initiated via menu options or at any time via function keys. Redrawing of points, constructions, drawn lines etc, and the grid can be interrupted with Escape or the Adjust button. This is particularly valuable when you initiate a redraw, since you can end it as soon as the parts you want are on screen. It is also useful when you have loaded a very big drawing, and it turns out to be the wrong one.

The current "view" of the drawing is controlled via Pan and Zoom. Panning can be in any direction, by cursor or co-ordinates. "Zoom All" brings the whole of the current drawing into view (which can be very useful if you have "lost" it !), while keeping the aspect ratio correct (unlike TurboCAD). "Zoom Paper" shows all that is within the current paper size, and "Zoom Window" allows any part of the current view to occupy the whole drawing area. Moreover, this may be repeated very many times, since the numeric range is so large. Up to 10 "views" can be recalled via the number keys, with the number being shown on the screen. Furthermore, both Panning and Zooming are "nested", so the "views" may be displayed in turn, by selecting "Zoom Last" and "Zoom Next" – both of which are also available on function keys.

Settings

A large number of settings may be changed via this menu. These include the drives for the system and data discs, the default paper size, the pen colours, and the plot destination. PDT provides a grid formed from two sets of linear arrays, each adjustable for spacing and for angle. It may also be hidden, and disabled. For orthogonal alignment, there is the option of the long cross-hairs cursor. For isometric and other angled views, when the grid is set accordingly, they are supplemented by dotted cross-hairs at these angles.

Of the eight available line types, four are fixed (solid, centre, dashed, and dotted), and four are definable by the user, but have existing defaults. Line widths are not differentiated on screen, and on paper are limited to those of the available plotter pens. (eg 0.2 to 0.8 mm). While PDT can display up to 15 steady line colours on screen, the number on paper is limited to 10 or the maximum supported by the plotter/pen changer. For most HPGL and compatible plotters, the maximum is eight, but for some it is only four (or one!). Most of these settings are held in a PDT configuration file.

Layers

PDT supports up to 16 logical layers. In addition to the current drawing layer, there is a current layer for points, and another for construction lines and circles. The defaults are 0, 15, and 14 respectively, but all can be set by the user. In PDT, each layer can be set to any pen number (from 1 to 10 max), and the pens to any colour (of 16, including flashing !), in succession. Any of the layers may be locked against objects being changed directly or deleted. You can also turn layers on and off, and the drawing is displayed and plotted accordingly.

Drawing

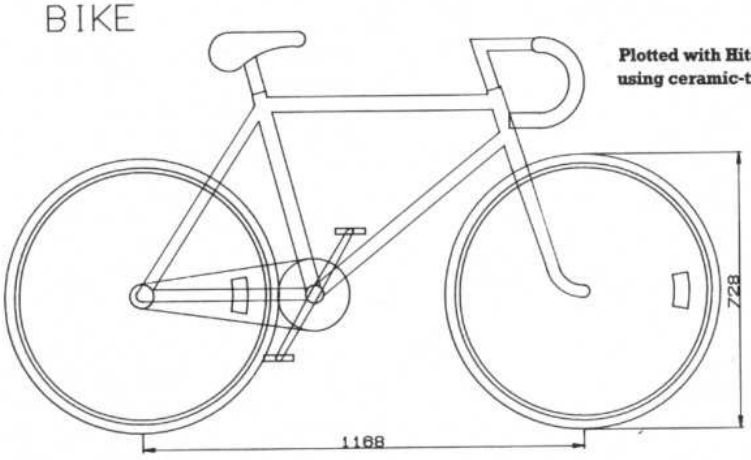
Points may be entered at the cursor position, or as numeric co-ordinates from the keyboard. However, packages such as AutoSketch only has these two, true CAD packages like TurboCAD and PDT have many more ways of defining points. Indeed, for a parametric CAD package points are even more important, whether entered as such, or via construction and "drawn" lines and circles. Whereas construction lines are infinite, and construction circles complete, (to ease positioning), "drawn" lines are of finite length, and arcs, as well as circles, may be "drawn". A wide choice of drawing options are available. When selecting objects (points, constructions, lines etc), the "snap" distance is about one tenth of the screen width, and they then flash red-green. PDT allows rubber-banding over more than one screen view (by panning and zooming), when drawing lines, circles, arcs, dimensions and text.

Rectangular boxes are not supported directly, but can be drawn quickly using a combination of angled, parallel, and perpendicular construction lines. If aligned with the grid, they are even easier. Neither are other regular polygons supported directly. However, they can be drawn quickly starting with a point, then drawing successive lines using "PtAngRel" at 360/n, (where n is number of sides), using the "useful point" at the end of each line.

Tangents to circles, and normals to lines and circles and arcs are supported directly. Arcs can be drawn in only two or three ways by themselves, but they may also sit parametrically on construction circles, which can be drawn in seven different ways. Fillets cannot be drawn automatically, but a construction circle can be drawn, of known radius and tangent to two lines or circles, and an arc drawn on part of it.

Ellipses and splines (usually a cubic in CAD) cannot be drawn directly in PDT, or shown precisely on screen. However, along with parabolas and hyperbolas, and complex trig formulae, they can be constructed parametrically, by defining a series of points using the function. The curves may then be represented on screen and on paper by approximations, using either multiple straight lines ("polylines"), or 3-point arcs – which are smoother but slower for movies. (see the PROJECTILE and LAMP drawings]. While AutoSketch,

BIKE



Plotted with Hitachi 762 XD using ceramic-tipped pens.

All five plotted figures are referred to in the text. However, Oak sent a disc with an ENGINE drawing to be used for a screen shot, so I do not expect you to use my plot of the engine unless the screen shot cannot be used.

Fig. 1	2-D CAD	PACKAGE	FEATURES
Computer	Arc 310	IBM-PC	Arc 310
Publisher	Autodesk	Pink	Oak
CAD Package	AutoSketch	TurboCAD	PDT
Price ex VAT	£ 79	£ 99	£ 295
Display Resolution	640 x 256/512)	Herc, CGA	640 x 256/512
Display Colours	16)	Olivetti, EGA	16
Precision - sig figs	7	11	16
Max Objects	2000 million	65536	4000 million
On-Line Help	n	Y	Y
RAM Free Displayed Cont.	in K	in K	in K
Co-Ords Displayed Cont.	n	Y	Y
Keyboard Control	n	Y and	n
Mouse Control	Y	Y and	Y
Digitiser Pad Input	n	Y 5+	n
Zoom	Y	Y	Y
Pan	Y	Y	Y
Redraw	Y	Y	Y
Linear Grid	Y	Y	Y
Linear Lock/Snap	Y	Y	Y
Angle Lock/Snap	Ortho	Ortho	Y
Attach to Object	Y	Y	Y
Line Types	10	4 to 100	8 at once
Line Widths	Pen plus Group	256	Pen Only
Line Colours	8	16	10 (pens)
Layers	10	128	16
Points	Y	Y 17	Y 7
Lines	Y	Y	Y 12
Rubber Banding	Y	Y	Y
Boxes	Y	Y	n
Polygons	Y	Y	n
Tangent	n	Y 4	Y 6
Normal	n	Y	Y 2
Arcs	Y	Y 7	Y 3/7
Circles	Y	Y, as Arc	Y 9
Ellipses	Spline only	Approx	n
Spline Curve	Y	n	n
Freehand Line	Spline only	Y	n
Text	Y	Y	Y
Fonts	1, variable	5, variable	1, variable
Repeat Objects	n	Y	n
Hatch Area	n	Y	n
Dimensions	Y	Y	Y
Associative Dimensions	Y	Y	Y
Align Dimensions	Y	Y	Y
Undo Last	Y	Y	Y
Undo Series	Y	n	n
Redo	Y	Y	n
Change Property	Y	Y	Y
Window or Group Objects	Y	Y	NA
Open/Close Window	Y	Y	NA
Stretch	Y	Y	Y
Break/Trim Line, Arc	Y	Y	Y
Insert Parts	Y	Y	Y
Macros/Command Files	n	Y	n
DXF File Input	Y	Y	n
HPGL File Input	n	Y	n
Output to Scale	Y	Y	Y
Printer Output	Y 7+	Y 5+	Y Many
Plotter Output	Y 20+	Y 14+	Y Many
HPGL File Output	Y	Y	Y
DXF File Output	Y	Y	n
Sprite Output	Y	n	Y
What if/Simulations	n	n	Y
Animation/Movies	n	n	Y

and TurboCAD appear to show ellipses and splines on screen, they exist only as polylines, and you cannot construct tangents and normals to them. PDT also supports "composite functions", where a single expression behaves differently in different parts of the curve (typically by the use of the MOD and DIV operators). These are particularly valuable for defining cams, which are common in mechanical engineering. (see the ENGINE drawing). Since the behaviour of these "composite functions" is precise (and only the appearance on screen and on paper is approximate), they may be used in simulations. (see below).

Hatching is not supported directly at present (any more than it is in AutoSketch). However, you can draw a box of construction lines around the object, draw an array of construction lines across it at the hatching angle (using the grid as a guide), and draw hatch lines on these, ending at the boundary. Any of the eight line types (four of which may be re-defined) may be used, and they will be parametric – ie the hatching will adapt to changes in the shape and size of the boundary. As with most object-based drawing packages, PDT is not suitable for drawing "freehand" lines, since they would use memory much too quickly. However, "Line: At Cursor", and "Circle: Two Points at Cursor", and "Centre, Radius at Cursor" are provided for quick "sketch" drawing.

PDT supports the insertion of other drawings (eg components and details) into the main drawing. However, they cannot be scaled or transformed in any way – either during or after insertion – precisely because PDT is parametric. If this is required, a parametric grid may be created in a separate drawing with a combination of angled and parallel construction lines, and the object drawn on it. You will then be able to scale, flip, shear and rotate the object, before inserting it into another drawing.

Likewise, there is no "mirror" or flip function in PDT (although an object of the opposite "hand" could be generated on the main drawing by projection – with construction lines and circles). Alternatively, you could do a separate drawing, with eg all X offsets expressed in terms of the first, whereupon the mirror image could be produced by changing the sign of the first offset. Drawings of both "hands" could then be inserted into the main drawing. Thus a somewhat different way of thinking is needed to get the most out of a parametric package, but it has massive advantages when using Symbol Libraries (see below).

Dimensions and Text

Dimensioning in PDT is in accordance with British Standard 308, and may be aligned horizontally, vertically, or with the component. Other aspects, such as the size, and the number of decimal places etc. may also be varied. While in AutoSketch and TurboCAD the dimensions are "associative" (ie they change automatically with the size of the object), PDT goes further. In parametric drawings, any associated object and its dimension is also updated accordingly.

Currently PDT supports only the printable ASCII characters 32 to 127 (plus two special symbols for diameter and degrees, by re-defining the ~ and keys) – which usually suffice in practice. One text font is supplied as standard (though the user may supply and use others), and all text may be varied in width and height. To speed up re-drawing, the user can configure the "butterfly size", below which text will be replaced by a "butterfly". If the text is drawn on a separate layer (as is usual), redrawing may be speeded further by turning it off.

Editing

The properties or attributes of objects (points, lines etc, dimensions and text) may be changed or edited – ie how they are defined, the layer, the plotter pen (number, colour, and width), and the linetype. When operating in edit mode, the cursor flashes red-green. PDT is capable of "Undo Last" (edit). This goes beyond "Undelete", and allows any edit, from a change of pen colour to the redefining of an object, to be reversed if required. When editing named variables ("Scalars"), abbreviations of the names may be entered, ending with a full stop (as in BASIC keywords). The full name is then shown for confirmation, when prompting for a new expression.

In a parametric system, objects do not need to be windowed or grouped for moving, since – if they have been drawn correctly – they are already associated. Indeed, moving groups of related objects is far easier in PDT, since only a single variable need be changed. PDT does not support the copying of arrays of objects (such as all the holes on a pitch circle). However, simple objects can be drawn quickly eg with the aid of a construction circle, and the "construction line at an angle" menu option.

For groups of objects which will require to be replicated, it is best to create a separate drawing, and then insert it as required – either at the cursor or at numeric coordinates. Since they are defined parametrically in PDT, lines and arcs may be stretched and trimmed simply by redefining the end point. To break a line or arc, you redefine the one, and add a second.

A single PDT drawing may be edited to produce (plotted) drawings of a whole family of similar parts. This demonstrates the saving in data input possible with parametric CAD. (see the SPANNERS drawing).

Filing

The "Load/Save Drawing" display can show the full 77 objects of an Arc ADFS directory – which maximises the scope for organizing files – eg libraries of parts. Objects are highlighted by moving the mouse, and selected by clicking with the Select button. The name of the file is retained on the entry line, making it easy to insert the same part several times. You can also enter a full filing system, drive, and pathname, as well as a filename if you wish, and indeed other "star" commands on this entry line. Access to the Operating System is also available via the Utilities menu, eg for checking disc space free, and compacting discs etc.

The CC ROM/RAM board may contain up to 896k of RAM, which may be used as a RAM disc. With eg 128k of RAM, it can hold PDT data of all kinds

(drawings, snapshots, movies, and sprites), but would be too small to hold program code. It is faster than the Arc Winchester and may also be battery-backed – to retain its contents even when the computer is switched off.

ations", so using the translation utility will normally be preferable. For Desktop Publishing, PDT can output both sprites and "screens" (ie the whole drawing area) for Arc document processors, such as Graphic Writer and First Word Plus. In addition,

It may then be saved as a single file, and single-stepped forward and back, or run continuously. If the RGB monitor signal is combined into composite video, Movies can be output to a video recorder, eg for replay via a television.

Fig. 2

OAK	PARAMETRIC	DESIGN	TOOL	MENU	MAP	(PART)	
Draw	Edit	Display	Text	Layer	Settings	Dim'sions	Utilities	Filing	Plot
Points 7	Point 7	Zoom 6	HrzAtCsr	On/Off	Configure 17	Linear	Movies 8	Load Dwg	Plot Dwg
Cn-lines 12	Cn-line 12	Redraw	HrzAtPnt	Un/Lock	CrsorType 2	Horizontal	Snapshot	Save Dwg	Plot Wdw
Cn-circs 7	Cn-circ 7	Recalc	AngAtCsr	PenNo./Col.	Colours	Vertical	Scalars	InsAtCsr	Wdw Scaled
Lines 7	Line 7	Pan	AngAtPnt		LineStyle 9	Diameter	ListScalars	InsAtC'rd	PrintDwg
Circs 9	Circ 9	PanCo-ord			Cn Lyr 14	Radius	Memory	SaveSprite	PrintWdw
Arcs 3	Arc 3	PtsOn/Off			Pt Lyr 15	Angle		SaveScreen	
	Text 8	CnsOn/Off			AutoRecalc	Arrow			
	Dimension 18	GridOn/Off			Grid 5				
	Scalar		Precision						Pen Speed
	ListScalars		BflyLimit						X offset
	Del.Scalars		Width						Y offset
Scalars	Undo Edit		Height			Style 11	*commands		Set Scale

Importing

PDT itself cannot read drawings from other CAD packages (eg as DXF or HPGL files). However, a translation utility supporting these and more will be available later, at extra cost. One reason is that PDT drawings contain more information (about associations between objects). Even after importing, some editing will probably be needed (to establish relationships between previously separate objects, and possibly replacing absolute values with formulae) to enjoy the full advantages of parametric CAD. Another reason for translation to be via a separate utility is that PDT then has more space for drawing data – which is important in a 310.

Output

PDT supports only plotters which use the Hewlett-Packard Graphics Language (HPGL) and paper sizes from A5 to A0. However, this language is by far the most common for plotters of these sizes, and many other makes are compatible, including Hitachi, Plotmate, and Roland. Colour makes plots much easier to understand. A single-pen plotter is really only bearable for single-colour plotting (especially as plotting may not be organized so as to minimize pen changes). If you want to do colour plotting at all regularly, you need a multi-pen plotter. The plot can also be sent to a disc file, for plotting later or elsewhere. "Plot Drawing" plots the extent of the (current) paper size. Although no "plot box" is shown, you can check the size by "Zoom Paper". "Plot Window" clips a window from the drawing, whereas "Plot Window Scaled" plots a window scaled to the current paper size.

For output to an Epson-compatible dot-matrix printer, PDT uses the Arc *HARDCOPYFX screendump in Mode 12 by default. However, the manual explains how to dump from Mode 20 (with twice the vertical resolution of Mode 12), even without a multi-frequency monitor. The user may also supply and use other dumps – eg for colour printers.

For exporting drawings to other CAD packages, HPGL files can be read by some (though TurboCAD does not read them correctly). However, an HPGL file contains only straight lines, and no "associ-

HPGL files may be imported as "line art" into Aldus Pagemaker and Xerox Ventura Publisher (amongst others) – after conversion from the ADFS to the DOS disc format.

Simulation

Because drawings in PDT are parametric, (where objects retain their "associations" after editing), it is very much easier to carry out "what if ?" tests during the design process. By using named variables ("Scalars"), editing values and formulae becomes easier still. For example, all lengths could be defined as length + "Tolerance", (set initially at zero). Then to see the effect of tolerances on dimensions, "Tolerance" may be defined as a suitable value (positive or negative). Other physical parameters such as spring rates may be entered numerically, so that the force/deflection response of such systems may be simulated, and the output may take the form of drawings, tables, and graphs. (see the PROJECTILE drawing). A particular class of designs are linkages, for which PDT allows checking for clearances and "clashes" by simulation. Their complete cycle of operation may be shown – either as a series of plots, or as "snapshots" assembled into a "movie", which may be stepped through, or run on screen. (see the ENGINE, LAMP, and BIKE drawings).

Animation

PDT is unique among 2-D CAD packages in enabling the easy creation of animated CAD, thanks entirely to the drawings being fully parametric. The Utilities menu provides access to everything required. The Scalars options allow the editing of variables in the current drawing. "Snapshots" of the drawing may then be saved in the form of the Acorn VDU codes, which draw on screen very quickly.

On entering "Movie" mode, "Load Snapshot" allows these to be assembled into a Movie, which automatically loops back to the beginning. The memory free (in K) is displayed continuously, while the Memory option returns the number of frames/snapshots in the movie, and the memory used and memory free (in bytes). Snapshots may be deleted from, and other Movies appended to, the end of a Movie.

Examples

The PROJECTILE drawing is an example of a simulation. The trajectory is a parabola, and the simulation can predict many aspects, including the range, time of flight, etc. If you ask "What if ?" questions by entering new values for certain variables, both the graph, and the tabulated values and results are updated.

The ENGINE drawing has cams which are defined as a "composite function", consisting of a circular arc, with the cam lobe defined by a trig function, approximated by short straight lines for display. This drawing also illustrates possible clashes – eg the con-rod with the crankcase, and the valves with the piston. The screen shots in the figure are still frames from the movie, which shows the movable parts in synchronised motion.

The "Anglepoise" LAMP drawing includes three orthogonal views, which are linked parametrically via construction lines, and several ellipses. It has been used to create a most impressive demo movie, with 149 snapshots as frames, which take 35 s to run through once.

I entered the BIKE, (based on a demo drawing supplied with AutoSketch), into PDT as a good example for parametric CAD. Firstly, any bicycle is adjustable for the height of the seat and handlebars. Secondly, changes to the length of crank and sizes of chain wheels are possible. Thirdly, while the number and relationship of the bars remains essentially the same, frames can differ in shape and size. This depends upon whether they are to be used by children or adults, or for touring or racing. All these changes can be made (by editing the expressions of relevant variables) without the need for any more drawing. I produced a Movie of it with the pedals rotating, along with the wheels, using several scalar variables. The most important is CRANKANGLE, but I also defined CHAINWHEELRAD and SPROCKETRAD, and WHEELANGLE as CRANKANGLE * CHAINWHEELRAD/SPROCKETRAD – so that the relative speed of rotation is correct. It took me about a day to enter the BIKE drawing, which contains 322 objects, occupying 5107 bytes, and create the movie, which has 12 frames.

Documentation

PDT is easy to learn, since it handles in a logical and consistent fashion. The menu structure is such that you soon learn where to find the options you require – aided by the on-line help. The substantial (and illustrated) manual includes a tutorial section, describing the drawing of a spanner, and then of a quick-return mechanism, and making a movie of the latter. There is also a comprehensive reference section, complete with an index. A drawing of a menu map is included on the distribution disc, which may be output to your plotter.

Performance

The most important aspect of performance in a CAD system is the screen Redraw time. This varies with the package, the machine it runs on, the screen mode, and – most importantly – the drawing itself. Clearly if updating of the screen after any change takes too long, the system becomes unresponsive, and unattractive in use – if not unusable. Indeed, this consideration may well determine the maximum size (or complexity) of drawing that the system can handle in practice.

The times for the "Shuttle" drawing on several CAD systems are shown in Fig. 3. This shows that the Redraw time in PDT on the Arc is similar to AutoSketch and TurboCAD on their respective machines. This is a notable achievement, since Redraw in PDT is comparable with Regen in TurboCAD and AutoCAD. (Recalc is only required in a parametric package, which is why PDT is only practicable on a fast machine like the Arc). The redraw times of PDT on the Arc with only a software Floating Point Emulator compare well with those for AutoCAD on an 8 MHz PC-AT with a hardware Floating Point Unit.

When a comparable Unit becomes available for the 400 series Arc (in the first quarter of 1989), PDT should be up to seven times as fast, and thus faster than AutoCAD on such a machine. The times taken on this test approach the "worst case", since the drawing is large and it is all on screen. Most drawings are smaller, and most work is done with a partial (zoomed) "view" – which takes only a second or two to redraw.

Availability and Prices

PDT is available only directly from Oak Professional Software. One reason is that each copy is "personalised" (which shows on screen), as a security measure. Another reason is that effective support to users is likely to require specialist knowledge. PDT is therefore available at several different prices. The standard price for the software alone is £295 plus VAT, but this is subject to a substantial discount for education. Systems Maintenance (which includes later enhancements) is available for £45 plus VAT, and Telephone Hot-Line Support for £25 plus VAT – both per year.

DISCUSSION

For display, the Arc offers 640 x 256 x 16 colours with a standard monitor, and 640 x 512 x 16 colours with a multi-frequency monitor. The latter is a higher resolution than either an IBM PS/2 machine with VGA, or the Apple Macintosh II, which are both far more expensive. Whereas the Arc offers 1Mb or 4Mb of RAM, all directly addressable, packages running on PCs under DOS are limited to less than 640k which is directly addressable (though they may also use "paged" memory, which is slower). The "standard" 2-D CAD package for running on PCs under DOS is AutoCAD, which costs around £2500. CAD packages which run on the Mac II, and on fast PCs and workstations under Xenix or Unix can access more memory directly. However, both they and the hardware are even more expensive, while still lacking the advantages of PDT and the Arc.

For PCB design, PDT supports multiple layers (eg for component-side, solder-side, silk-screen, and drilling jig). Furthermore, being parametric, it is able to maintain the connections (or "rats nest"), when components are moved. However, PDT has no support for line (track) thicknesses wider than a plotter pen, nor for filled areas. (You have to hatch them, or fill them manually after plotting). This means that PDT is currently less suitable for producing artwork than a specialised PCB CAD package such as Lintrack. (see A&B, 88/8, p36). However, PDT can provide the information for drilling holes in a PCB.

As shown by the examples, PDT is especially suitable for the design and simulation of mechanisms and linkages. However, it also offers special advantages in the design of – and with – static components, since these increasingly form "rational" families, which can be represented parametrically. This is equally true in architectural design, which is increasingly based on factory-made "modular" components. Thus while the ease of editing puts PDT ahead of all its contemporaries, its capabilities will advance further when the "Symbol Libraries" become available. (see below).

Oak have been invited by Acorn to show PDT on their stand at the Personal Computer Show in September.

Future Developments

Oak plan to produce an enhanced version of PDT with – amongst other things – a programming language, allowing "conditional geometry". However, since it will contain more code, this version will probably require more than 1Mb of RAM (eg an Arc 440).

"Symbol libraries" will become available for PDT – eg for use in electronic, mechanical, and architectural drawings. These will be parametric, which is ideal for describing "rational" systems of components, and means that the data will be particularly compact.

For the visualisation of PDT designs as 3-D models, it should be possible to transfer 2-D data to the Ace "Euclid" 3-D Graphics System. (See A & B, 9/88). Oak and Ace are currently working together to achieve this.

Oak plan to offer a complementary package for Computer Aided Manufacture (CAM). This will start with the drawing geometry, and generate the tool path, complete with tool radius compensation. Such data will be suitable for driving Computer Numerical Controlled (CNC) machine tools – including the 3-axis milling machine, capable of holding a workpiece of 300 mm (1 foot) cube, which they also intend to offer.

Fig. 3 PERFORMANCE COMPARISON USING "SHUTTLE" DRAWING

Package	Computer	F. P. U.	Display	Operation	Time - s
AutoSketch	Arc 310	Emulator	Mode 12	Redraw	5.7
			Mode 20	Redraw	6.9
TurboCAD	IBM PC-AT 8 MHz	80287	CGA	Redraw	4.7
				Regen	32.1
PDT	Arc 310	Emulator	Mode 12	Redraw	6.7
				Recalc	8.5
			Mode 20	Redraw	8.4
				Recalc	10.8
AutoCAD v2.6	IBM PC-AT 8 MHz	80287	CGA	Redraw	1.7
				Regen	8.3

Results courtesy of Oak Professional Software

Conclusions

Although the Oak "Parametric Design Tool" is more expensive than AutoSketch and TurboCAD, it is far less so than AutoCAD. Moreover, it is both fully parametric, and fully interactive. These attributes minimise the data to be entered for a family of parts, allow "what if ?" studies such as the effects of tolerances etc., and enables the simulation of both static and dynamic systems – including the animation of moving parts and linkages eg to check for clashes and clearances. It is therefore truly a "design tool" which can greatly speed the design process. By taking full advantage of the Archimedes, PDT is more capable than anything available on a PC – or even a workstation – in many ways.

Factfile

Oak Professional Software are at: Cross Park House, Low Green, Rawdon, Leeds, LS19 6HA. ☎ 0532-502615.

Archimedes

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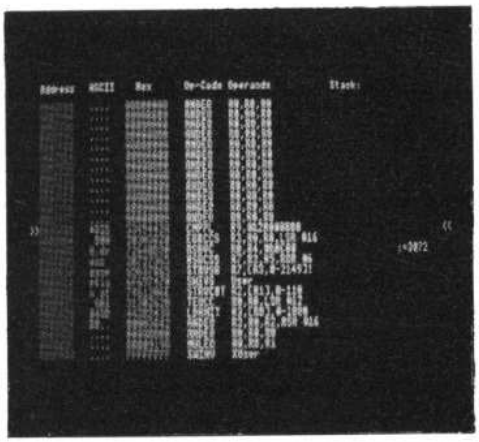

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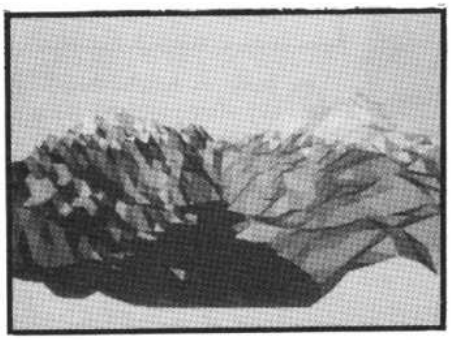

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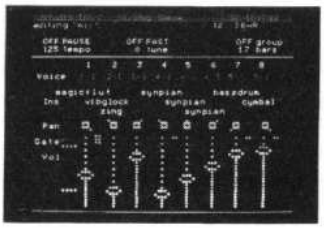

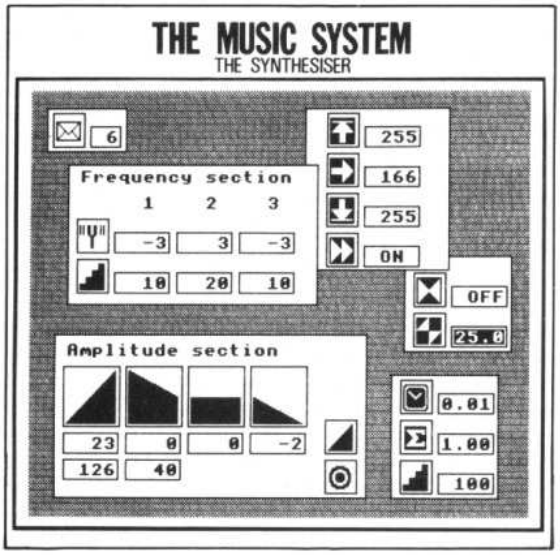

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Kenneth John

A package to enhance many features of your Master Compact

MISSION CONTROL

I am certain that no-one can ever be fully satisfied with just the basic equipment as is normally supplied when first purchasing a micro. Take the Master Compact for example. The limitations of the model would, one assumes, have been taken into account at purchase decision time. But if the pocket was then the overriding factor, beggars cannot be choosers! Consequently when something comes to hand which enhances the fundamental equipment to a degree not far short of the models you could not afford, life starts to be more rosy.

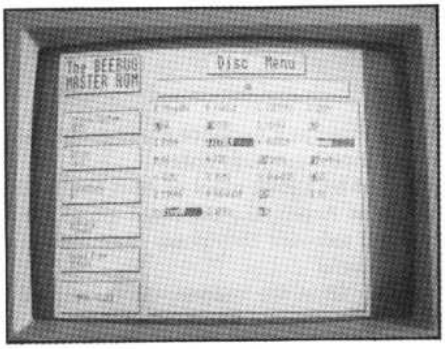
I came across Master ROM out of the Beebug stable a few months back and have regularly used most of the facilities it claims for itself. Getting started was a straightforward fitting of the ROM as instructed. Just as an aside, lately it seems to me the keyboard spends nearly as much time apart with some chip or other being inserted as it is joined together so serious word-processing and other uses can take place. To continue! Fitting was straightforward and checked with a *HELP. If by any chance you put a fullstop after *HELP MAS followed by <RETURN> *forty eight* star commands are displayed, which immediately gives you some idea of the range of facilities available. These fall fairly readily into four groupings, which I use to illustrate and comment on the package.

Before proceeding it is worth saying all but seven of the operations available, other than *, are effected by use of <CTRL> together with a single *alpha-key*. The seven also require <SHIFT>, and one is a <RETURN> only operation.

1) Disc menu

Sorry you DFS people this is primarily for ADFS users, although if the limitations as given are accepted, fine, DFS systems can utilise quite a number of the facilities. On entering *M(ENU) all files in current directory are displayed in the default mode of 80 columns. A press of <CTRL-W> toggles to 40 column mode, and back again as desired. Other easy keyboard uses include pressing 0 twice to mount a disc while <CTRL-T> is used to toggle between Menu and Control Panel. Pressing <ESCAPE> takes one back to the language from which Menu was called. Figure 1 illustrates a typical Menu screen. It is also possible to change the colour of fore and background, <CTRL-F> or <CTRL-B>. If however your monitor is green to begin with it seems to me you have a Henry Ford choice, any colour provided it is green on black!

The single letter displayed against each item in the main window is used for selecting that item. Staightforward messages appear in a window with explanation of next key to press or offering the user four options.

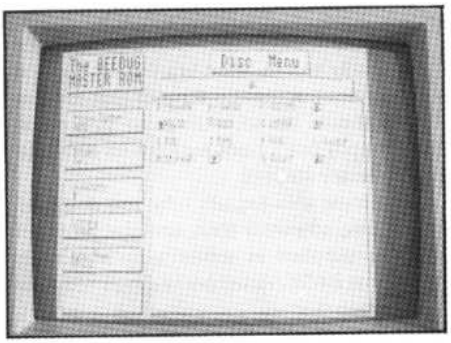


Four selectable options

Directories and drives An information giving facility. Combination usage of cursor keys and <SHIFT> moves the user between directories, whereas pressing the number key equivalent to the drive number you require, changes the drive. If by chance your disc is unmounted at this point a double press om 0 will overcome. **BASIC program** Confirmed or not by an appropriate message, this enables a BASIC program to be loaded direct by pressing <CTRL-L>.

ROM image On selection a display of all current ROMs at load address &8000 and, an indication of those sockets that contain RAM. <ESCAPE> takes one back to Menu while keying the number initiates selection of the RAM socket.

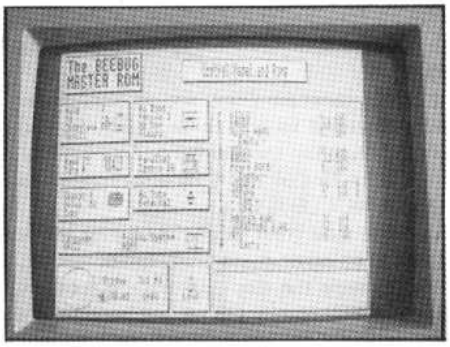
Unrecognised files This provides for the situation when the item selected from Menu is not under any of the previous categories. The user is then presented with the message 'File not BASIC or ROM image'. Five alternative actions are offered, see Figure 3. Of these the use of <RETURN> presents one with a useful facility for *executing* a predetermined file. Useful for calling and setting up the ever-needed wordprocessing loader.



Making ones mark

Operations on files can be undertaken subsequent to marking, ie selecting, which is achieved by <CTRL-M>, being confirmed by a message in the bottom left window, see Figure 2. 'Selecting' is by pressing <SHIFT> and the key matching the letter against the item to be worked on. Use of <SHIFT-CTRL-M> or <SHIFT-CTRL-U> marks or unmarks all files at one go. Once marked, files can be attributed, copied, deleted, renamed. User friendly messages appear at the appropriate times and most operations are only single or dual key presses.

DFS users meet some technical difficulties which seem to me minor, eg files in current directory only are displayed; cursor keys will not swap directories; *FREE is required to determine free bytes available.



2) Control Panel

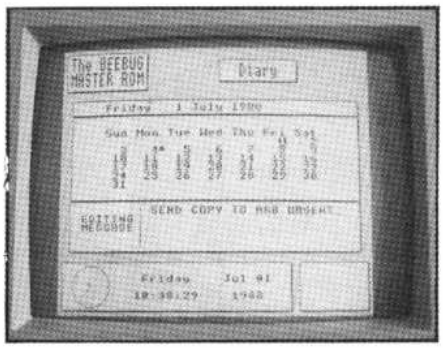
Three uses of the Master ROM are to hand:
i) display and alter the battery-backed configuration settings
ii) set/adjust internal clock, where it exists; and
iii) the "plugging in" and "plugging out" of ROMS.

If your computer has no internal clock or battery-backed systems you don't have to have any O levels to work out what use this is to you.

*(P)ANEL, or <CTRL-T> when in Disc Menu mode, calls up a display which is divided 'mechanically' down the middle. On the right the ROM menu, on the left the Configuration settings. An enhanced facility for Master 128 users is the storage of chosen fore and background colours, via the battery backed RAM, for future use.

Configuration settings

Users of the Welcome pack associated with the Compact will be familiar with the screen displayed. It would be futile to list the settings. The same rules of the game apply to making changes to the settings as with any other package. I have one fundamental rule, check once, check twice and then check! Then I press the appropriate activating key, and not before. Common with the whole of this package user-friendly messages appear at appropriate places. A small but practical and useful feature is the ability to load and save settings to disc for recall at a later date.



3) Diary and alarm

Real-time is of an essence here. Without it models other than the Master 128 must enter the current day's date on power-up to gain access to the Diary.

Calendar for the year, in quarters, or single month can be displayed. Use of <CTRL N> before <RETURN> allows the calendar to be viewed in three month chunks on <SHIFT>. If this is not done the months rapidly pass before your eyes until December is reached, which when you think about it isn't very useful.

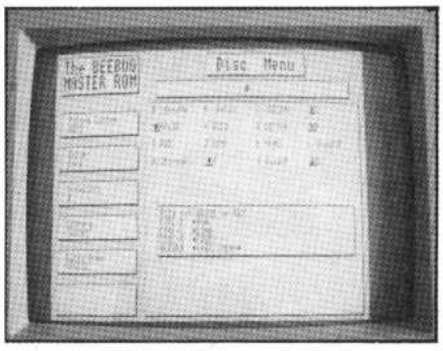
As one would expect of a diary it provides the functions of one's calendar and appointments. The editing facility enables terse messages to be entered and an alarm bell rings on power-up to remind one to refer to the appointments for the day. The *Alarm <<date>> command is only functional, normally, on the Master 128. However for Compact users the fitting of an RTC chip and battery, equates the Compact, in this respect, to the Master 128.

To be able to print out a month's apointments in advance would, it seems to me, be a practical and useful facility. In essence this is possible but only those days on which a message has been entered are printed, and the space used on the paper is equal to the actual message Consequently if you have a full appointments diary at least two sheets of A4 will be required to print the month out. To give Beebug their due, nowhere do they suggest a printout is a feature of the package.

4) Disc commands

The package provides twenty nine such commands ranging from *BACKUP to *WIPE, again they are designed for use with ADFS, and it is claimed, provide many extra facilities not normally available to ADFS users. The manual, which overall I have found to be very clear and concise, indicates where and when the commands are DFS compatible. Full explanation of required parameters are given, as are explanations of application.

One particular utility which caught my eye was *S which allows the user to save a new version of a BASIC program, without, and this must be the crunch, overwriting the previous version. Latest name and version number are automatically included in the listing. Essential easily understood prompts occur during the procedure, so no troubles.



5) Printer buffer

One of the most useful utilities the Master ROM provides. With only four commands it provides the user with up to 64K extra sideways RAM as a printer buffer. I suspect most printers provide no more than 1K or 2K which is very limiting when dealing with a lengthy article. Choice of the number of the banks to be used ensures you know where space is still available for other purposes. Without going into too much technical detail, and by this time you have probablly realised I am not much cop at that anyway, Master Compact ROM sockets 4,5,6,7, each containing 16K of sideways RAM are available. To avail themselves of this facility BBC Model B users must fit a carrier board. *BUFFON, *BUFFOFF and *BUFFCLEAR are operating commands, while *BUFFINFO provides buffer status information, Figure 4, when the printer buffer has been activated.

6) RAM disc

This facility also makes use of the Sideways RAM available on banks 4, 5, 6, or 7. That is if you have not pre-arranged for these to be available for printer buffer or whatever. Up to 64K of sideways RAM is, as a disc, there for use. Beebug claim space for up to 15 files and programs. Specific uses being storage of often used BASIC and machine code utilities, and for manipulation of screen memory. Power-off destroys all that is on RAM disc so saving becomes an even greater requirement, or don't switch off! Speed is the virtue par excellence, equivalent to that of a hard disc, anything up to four secs faster for the same task. Oh dear, life is so short!

Making a backup is achieved for B+ users via the Control Panel so as to make use of the RAM/ROM feature. I assume the same is possible for Master and Compact users though an alternative *SRSAVE together with a *SRLOAD with an address of 8000+ 4000 n where n is the number of the required bank.

Assessment

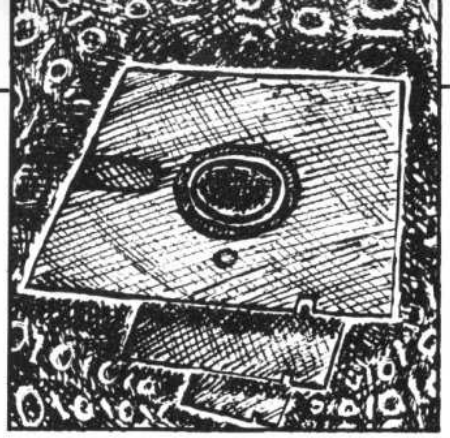
A package which provides a ready and easy access to, as far as I can see, all the commands and utilities which are more often than not on another disc, probably buried amongst all those redundant ones! A reasonably good guide on the whole, though perhaps some of the instructions and explanations could have been a little more full. I give full marks in as muchas adequate warnings are given if there is any danger of erasure or overwrite. Messages are on screen and in the guide, but although the latter are italicised, they do tend to be near the end of the section. So make sure you read all of each section before bashing on! The copy I have has an addendum insert, crucial, but this didn't iron out the little things like wrong page numbers and references to wrong sections. No problem for anyone as patient as me (no comment – Ed).

Perhaps there is a link between the striving of designers and developers of programs to make things happen more and more quickly and guide book errors. The former are creating time for us to work out the errors of those who create manuals! Future copies of the guide, I trust, will have been corrected.

Conclusion

Yes it makes life easier, and a little faster, if not in the outside lane; seems one has to be in the Archimedes world for that. It is a positive, useful package.

Allan M Gardner



JUKE BOX JURY

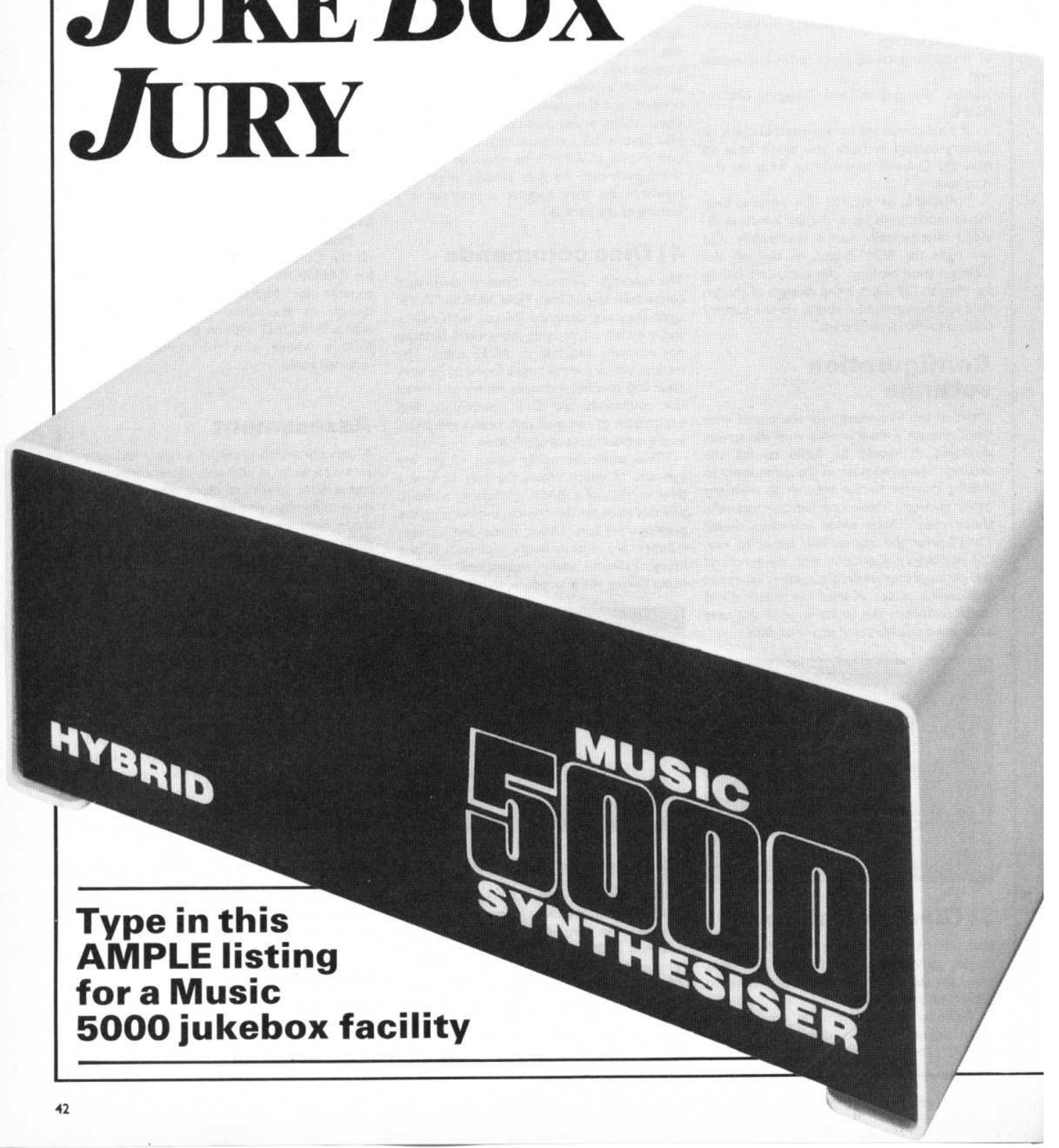
With this program, you can compile all of your AMPLE and Studio 5000 programs onto one disc and play them back in order or repeating – just like a real pub jukebox!

My program has significant advantages over some of the other programs available on the public domain and, indeed, on some of the commercially available jukeboxes:

- There is no need to update the 'Jukebox' program whenever a file is added to, or deleted from disc.
- It Provides automatic, sequential playing of music files.
- It can repeat play a single music file up to 63 times.
- It will generate a text file on disc, of the words needed to add to any music file, to enable it to chain another file on finishing.

All the files in the $ directory must be AMPLE NUCLEUS files.

Please take great care when typing in the listing as an error could crash the computer, or even wipe the disc if an error is made in the OSGBPB routines this is not because of a Bug in the software or the Ample nucleus system, but the Studio 5000 software is driving the Beeb to its limits with heavy use



Type in this AMPLE listing for a Music 5000 jukebox facility

of interrupts that can easily be interfered with.

For this reason, it is recommended that a backup of the program is made before running for the first time.

Incorporating The Studio Disc

Putting **"Jukebox"LOAD RUN**, into function key f9, will load the menu program in the normal manner, but before presenting a menu of files, it will check whether or not a file sequence has been previously programmed. If a sequence has already been enabled the next file in that sequence is LOADed and RUN.

When the last file in the sequence has finished, or no sequence had been programmed, the menu of files in the current directory is presented to the user.

File Selection

The *highlight cursor bar* is moved around the screen of filenames by using the cursor keys. (The cursor is prevented from moving onto a blank entry).

When the required file is highlighted the <RETURN> key can be pressed and the file will be loaded and run.

Sequence Programming

Alternatively, the <Copy> key can be pressed and the file will be entered into a play sequence.

The file position in the sequence is displayed as a number to the left of its name.

The cursor can now be moved to any file (including leaving the cursor on the same filename) and another selection entered into the sequence. Up to 63 files can be entered.

The sequence is started by selecting the last file in the play list and pressing <RETURN>. – *Note that a file selected more than once has only its last entry number indicated.*

Clearing The Sequence Buffer

If a mistake is made whilst entering files into the play list, or the user has merely had second thoughts about programming a sequence, the sequence buffer can be cleared by pressing the **r** key. (in much the same way as run is treated in the mixing desk)

The sequence buffer will then be cleared and the screen is rewritten with the filenames.

The disc could be swapped before pressing **r** to present a different set of files to choose from.

Automatic Running Of Play List

If the user's music files don't contain the necessary words to enable automatic chaining of one file to another, then when the music has ended, pressing function key f9 will LOAD and RUN the Jukebox as normal.

The Jukebox will find the next file in the sequence and then LOAD and RUN it.

This will continue until the last file has been played, whereupon Loading and running jukebox will present a menu page, as before.

Aborting The Play List

You may wish to abort the current play list, (ie. force the Jukebox to present the menu page without playing any more files from the play list).

This can be accomplished by using the command: "Jukebox"LOAD run. (note "run" is in lower case) – this will clear the sequence buffer before running the program

For convenience the function key f4 (normally defined as CLEAR) is defined as "Jukebox"LOADrun<Ctrl>M if, and only if, a sequence is in operation.

Generating CHAIN Words

As some users may not know how to enable one file to CHAIN another,the Jukebox program is able to generate the necessary words, onto disc, automatically.

Type **"Jukebox"LOAD** then type the command: **chaingen <RETURN>**

A text file can be on the current disc with the name T.CHAIN. This file can be written from either the notepad, or by typing

```
 %
"RUN" []  "cblk" [] "chain" []          "chaingen" []       "chainwrt" []
"curoff" []         "dsktitl" []        "end" []  "finished" []
"fndnxt" []         "getcat" []         "gettitle" []       "logo" []
"names" []          "newx" [] "newy" [] "no-x" [] "no-y" [] "numfils" []
"oldx" [] "oldy" [] "ord" []  "pick" [] "print" []          "printitle" []
"prog" [] "prompt" []                   "ptr-a" []          "ptr-b" []
"refresh" []        "run" []  "save" [] "screen" []         "select" []
"spool" []          "start" []          "tab" []  "update" []
"wipestor" []       "zblk" []
```

```
"RUN" [
fndnxt  % find next file in sequence
]
"cblk" [
6 DIM % reserve memory for
      % OSGBPB control block
]
"chain" [
% part of chain generator

REP( finished #? )UNTIL( IDLE )REP
"""Jukebox""LOAD RUN"$+
]
"chaingen" [
% CHAIN generator
% writes a text file called T.CHAIN
% to disc so that 'chain' words
% can be *EXECed into the user's
% own music files.

"SPOOL T.CHAIN"OSCLI
chainwrt
spool
]
"chainwrt" [
% part of chain generator

"""chain""TYPE"$+
"""end""TYPE"$+
"""start""TYPE"$+
"""finished""TYPE"$+
]
"curoff" [
% turns off cursor

23 #OUT 1 #OUT 8 FOR(0 #OUT)FOR
]
"dsktitl" [
10 DIM  % reserve memory for disk title
]
"end" [
% part of chain generator

REP( QTIME -100 #< )UNTIL( IDLE )REP
ON finished #!
]
"finished" [
% part of chain generator

GVAR
]
"fndnxt" [

% finds next file in sequence
% to play & LOAD RUNs it.
&900 ptr-a #!
REP( ptr-a #? &B00 #> )UNTIL(
ptr-a #? #B? 0 #= )UNTIL(
ptr-a #? #B? 42 #=
)UNTIL( 8 ptr-a #+! )REP
ptr-a #? #B? 42 #= IF( 88 ptr-a #? #B!
$2 ""7FOR(1 ptr-a #+! ptr-a #?
#B? $CHR $+ )FOR
7 MODE "FX4,0"OSCLI
$STRIP 34 $CHR $+ $REV 34 $CHR $+
"LOAD RUN" $12 $+ )IF
ptr-a #? #B? 0 #= IF(run)IF
ptr-a #? &B00 #>  IF(run)IF
]
"getcat" [
% gets catalogue from disc -> names .

zblk                        %initialise
names cblk 1 #+ #!          %control
31 cblk 5 #+ #!             %block

cblk 8 &FFD1 CODE #2 #2 %call OSGBPB
]
"gettitle" [
%gets title from disk -> dsktitl

zblk                        %initialise
dsktitl cblk 1 #+ #!        %control block

cblk 5 &FFD1 CODE #2 #2 %call OSGBPB
]
"logo" [
7MODE 0 0 tab5FOR(134#OUT157#OUTNL)FOR
2FOR(8 COUNT tab 129 #OUT 141 #OUT)FOR
10 1 tab "Rcacccmmcb!c Jukcbau"$OUT
10 2 tab "PFogFuMMudte Jokedox"$OUT
14 3 tab 132 #OUT
"(c) 1988 Allan M Gardner"$OUT
prompt
```

```
]
"names" [
500 DIM % reserve memory for catalogue
]
"newx" [
GVAR % new x-position for highlight
]
"newy" [
GVAR % new y-position for highlight
]
"no-x" [
% no filename in this x-position ?

newy #? 6 #- newx #?
13 #+ 13 #/ #2 11 #* #+
numfils #<
]
"no-y" [
%no filename in this y-position ?

newy #? 5 #- newx #?
13 #/ #2 11 #* #+
numfils #<
]
"numfils" [
% number of files on disc
% in CURRENT directory

31 cblk 5 #+ #? #-
]
"oldx" [
GVAR % x-position moved from
]
"oldy" [
GVAR % y-position moved from
]
"ord" [
GVAR % order of play in sequence
]
"pick" [
% highlight filename

oldx #? oldy #? tab
   128 #OUT 156 #OUT 135 #OUT
newx #? newy #? tab
   128 #OUT 156 #OUT 135 #OUT
newx #? 26 #< IF(
newx #? 13 #+ newy #? tab
   128 #OUT 156 #OUT 135 #OUT )IF
newx #? newy #? tab
   131 #OUT 157 #OUT 129 #OUT
]
"print" [
% print filenames

names ptr-a #!          %set ptr to start
numfils                 %number of files
FOR(COUNT 1 #- 11 #/    %calculate
#12 13 #* 6 #+          %    tab position
#12 6 #+ tab
ptr-a #? #B?            %LEN of filename
FOR( 1 ptr-a #+!        %incr. pointer
ptr-a #? #B? #OUT )FOR %print what's
                        %          there
1 ptr-a #+!       )FOR %move pointer to
                        %    start of next
]
"printitle" [
% print disk title
% (removing any colour codes)

dsktitl ptr-a #!
9 4 tab 129 #OUT "disk title: "$OUT
ptr-a #? #B? FOR(
1 ptr-a #+! ptr-a #? #B?
#11 126 #< IF(#OUT)ELSE(#2 " "$OUT)IF
)FOR
]
"prog" [
% program file sequence buffer
"KEY4|""jukebox""LOAD run|M"OSCLI
names ptr-a #! 1 ord #+! ord #?
#11 64 #<  IF(
newx #? 3 #+ newy #? tab NOUT
42 ptr-b #? #B!
newy #? 5 #- newx #?
13 #/ #2 11 #* #+ 1#-
FOR( ptr-a #? #B? 1 #+ ptr-a #+! )FOR
7 FOR(1 ptr-a #+! 1 ptr-b #+!
ptr-a #? #B? ptr-b #? #B!
)FOR
1 ptr-a #+! 1 ptr-b #+!
0 ptr-b #? #B!
)ELSE(#2)IF
]
"prompt" [
0 17 tab 7 FOR(132 #OUT 157 #OUT NL )FOR
2 17 tab 131 #OUT
"Use cursor keys to select file, then"
$OUT  4 18 tab 131 #OUT
"press <RETURN> to run that file."
$OUT  2 19 tab 134 #OUT
"Or press <COPY> to enter that file"
$OUT  7 20 tab 134 #OUT
"into a playing sequence."
$OUT  3 21 tab 131 #OUT
"Start the sequence by pressing"
$OUT  2 22 tab 131 #OUT
"<RETURN> to select the last file"
$OUT  9 23 tab 135 #OUT
"Press <r> to restart"$OUT
]
"ptr-a" [
GVAR % general purpose memory pointer
]
"ptr-b" [
GVAR % general purpose memory pointer
]
"refresh" [
% clear screen and
% reset sequence pointer

screen
0 ord #!
newx #? newy #? pick
#2 #2
]
"run" [
% runs Jukebox after clearing any
% currently programmed sequence.
% Also resets f4 to normal definition.

"KEY4 CLEAR|M"OSCLI
"FX4,1"OSCLI
screen
select
fndnxt
]
"save" [
% saves this program

"""Jukebox""SAVE"$+
]
"screen" [
% clears sequence and generates screen

wipestor
logo
gettitle
printitle
curoff
getcat
print
]
"select" [
% select file for running or storing
0 oldx #! 6 oldy #! 0 ord #!
0 newx #! 6 newy #! pick
REP( #IN #11 13 #= )UNTIL(
#11 138 #= IF(newy #? 16#< IF(no-y
IF(update   1 newy #+! pick)IF)IF)IF
#11 139 #= IF(newy #?  6#>
IF(update  -1 newy #+! pick)IF)IF
#11 137 #= IF(newx #? 21#< IF(no-x
IF(update  13 newx #+! pick)IF)IF)IF
#11 136 #= IF(newx #?  0#>
IF(update -13 newx #+! pick)IF)IF
#11 135 #= IF( prog )IF
114 #= IF(refresh)IF
)REP #2  prog
]
"spool" [
% part of chain generator.
% puts * S P O O L <RETURN>
% into keyboard buffer

&2A00 138 -12 CODE #2 #2
&5300 138 -12 CODE #2 #2
&5000 138 -12 CODE #2 #2
&4F00 138 -12 CODE #2 #2
&4F00 138 -12 CODE #2 #2
&4C00 138 -12 CODE #2 #2
 &D00 138 -12 CODE #2 #2
]
"start" [
% part of chain generator

OFF finished #!
]
"tab" [
% x-position y-position ->.

31#OUT #12 #OUT #OUT
]
"update" [
% last cursor position stored
% before moving to new.

newx #? oldx #!
newy #? oldy #!
]
"wipestor" [
% clear sequence buffer

&900 ptr-b #!
512 FOR(COUNT 1 #-
&900 #+ 0 #12 #B!)FOR
]
"zblk" [
% zero control block

:2 FOR( 0 cblk INDEX 1 #- #+ #! )FOR
}
 %
```

*BUILD "T.CHAIN" and then *EXECed into the user's own programs, they will then be able to fully utilize the sequence features.

Using The CHAIN Words

First the file to be chain enabled is loaded.

Then *EXEC T.CHAIN is entered.

The words "chain", "finished", "start" and "end" are added to the program.

The PLAY word (usually RUN) is edited to include the "chain" word eg:

"RUN"["123-abc"PLAY chain]

The "start" word is added to the start of the music data, and the "end" word to the end. For example:

"part1a" [start SCORE 48,1:ABC etc..]
"part1c" [etc..... bCdA 0; ↑ end]

It is not necessary to include the "start" and "end" words in the same PLAYER (ie part) as long as the "start" word occurs at the beginning and the "end" word at the end.

The chain word can be edited so that a file other than the Jukebox is chained, (eg. for multi-file pieces).

Saving The Jukebox Program

The Jukebox program (once loaded) can be easily saved by typing the command:

save <RETURN>

This will save Jukebox onto the current disc drive.

Points To Note

- The program has been written for standard Acorn DFS only.
- It has been checked on Acorn DFS 0.9, Acorn DFS 1.2 and Watford DFS 1.44 (31 file catalogues only).
- Other DFS's should not cause any problems provided they use standard OSGBPB calls.
- Filenames should not be more than 7 characters long (as per standard DFS limitations).
- If the ADFS is used, there are some simple modifications to make to cope with 10 character filenames.
- The program uses the STAFF Editor buffer as its sequence buffer – this occupies memory from &900 to &AFF.

On page 90 of the Music 5000 User Guide, it is stated that this section of memory can be used for general OS functions when the STAFF Editor data is not needed. This area is normally used by the OS for RS423, Cassette and Speech workspace. So provided none of these are used, this area is safe.

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EDUCATIONAL MUSIC

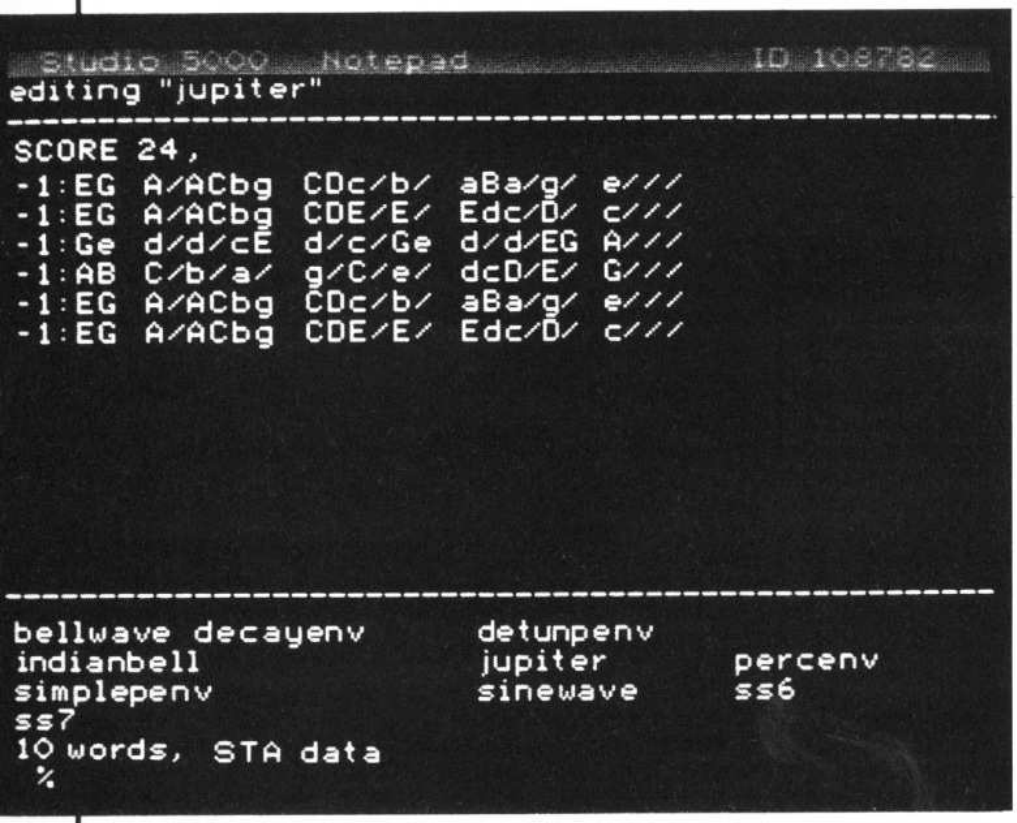
An in-depth look at the place of the micro in music teaching and learning

From the bottom...

One of the major educational software publishers is at present trying to rid itself of a musical menace that produces mixed reactions in its clientele. British Telecom in their wisdom have installed music chips on various of their phone systems so that when the caller is put on "Hold" a merry tune plays to keep them entertained and to ensure that they know that the company hasn't just put the phone down. In principle that might be acceptable, but in this instance a snatch of *Judas Maccabeus*, better known as the hymn *Thine be the Glory...* is played *ad nauseam* - melody only, in an electronic tinkle. The software house concerned has decided that rather than change the tune, they are better off without the thing altogether. For a contrast, try phoning Apple UK and get put on "Hold"!

That thin and reedy music is the quality of output that we have unfortunately to be satisfied with when we tackle music on most educational computers unless we attach extra equipment of quite significant proportions. This would firstly be an amplification system to improve the quality of the sound – what can you expect from a 3cm speaker; secondly, a music module like Music 5000 or similar would give additional facilities that allow true music synthesis to take place. The third addition would be a keyboard – even Chopin could not have played the Revolutionary Etude on a typewriter!

This article will address some of the possibilities of current software for the music classroom. It will not be examining hardware since that is already dealt with elsewhere in this magazine. It will try to give an idea of what makes a balanced suite of programs and will look at the educational viability of the software and the usefulness to the teacher as a classroom resource.



Old Classics

A few sets of material have been with us almost since the use of educational computers began. **The Music System** from System Software (remember the punk in the advert?) is a reliable and useful tool in the processing of music copy. Not only will it allow the user to create the music in both an audible and printed form, but it also allows editing of the score and playback in a variety of speeds and voices. Much has been written about it and it still representes good value for money – something which cannot be said of many programs after four years on the market.

The AB European/Mupados conglomerate is still very successfully marketing the *Recoder Tutor* packages and the *Music Master* materials that have found a place in so many schools. **Recorder Tutor** is a simple yet ingenious set of materials which allow the child to undertake a step-by-step course of study in the techniques of playing a musical instrument.

Now this may sound pretty dry, I hear you thinking, and if it were only working on that basis the package would be competent but boring. The tutor software itself draws the recorder for you and, in response to your input of the note to be played, marks the positions of the fingers on the recorder's holes. The software moves through a series of tutorial pieces which introduce the next level of use whilst reinforcing what has gone before. Each piece may then be played from the music on screen, with or without the help of a bouncing ball to indicate where you are playing and the relative lengths of the notes and with or without a metronome option.

Once the user is familiar with the piece, there then comes the master-stroke which makes this package an excellent resource. Nothing to do with the computer I'm afraid – just an audio tape with fantastic orchestral accompaniments to go with each piece. The soaring strings and strident horns which accompany a two-note recorder exercise make the child feel as if they are performing at Carnegie Hall. In terms of the motivation for the children, this pack is definitely a winner. Moreover, AB European produce a video tape which demonstrates the effectiveness of the material and some strategies for integrating into your music curriculum and teaching method.

The other package, **Music Master** is a small piece of hardware which attaches to the micro, with a microphone on a lead which clips onto a recorder. This little device and its associated software, allow you to play tunes on the recorder which are then registered by the computer and put into a musical score. This simple method of entry of music is not only impressive when first seen, but is also an extremely useful tool in the classroom.

Both of these packages are golden oldies that have been around for some time and it is quite likely that you will be able to find a colleague who already uses them successfully. However, since their development, other materials have been made which build on their shortcomings, or take a totally different route altogether.

Primary principles

The use of the computer in the primary school for music has to be either in the area of skill-development or of amusement. There is little point expecting anyone other than top juniors to make adequate use of programs that rely on understanding of musical notation. Hence, there have been created a number of packages which address directly the musical principles which infants and lower juniors should be developing. What are these?

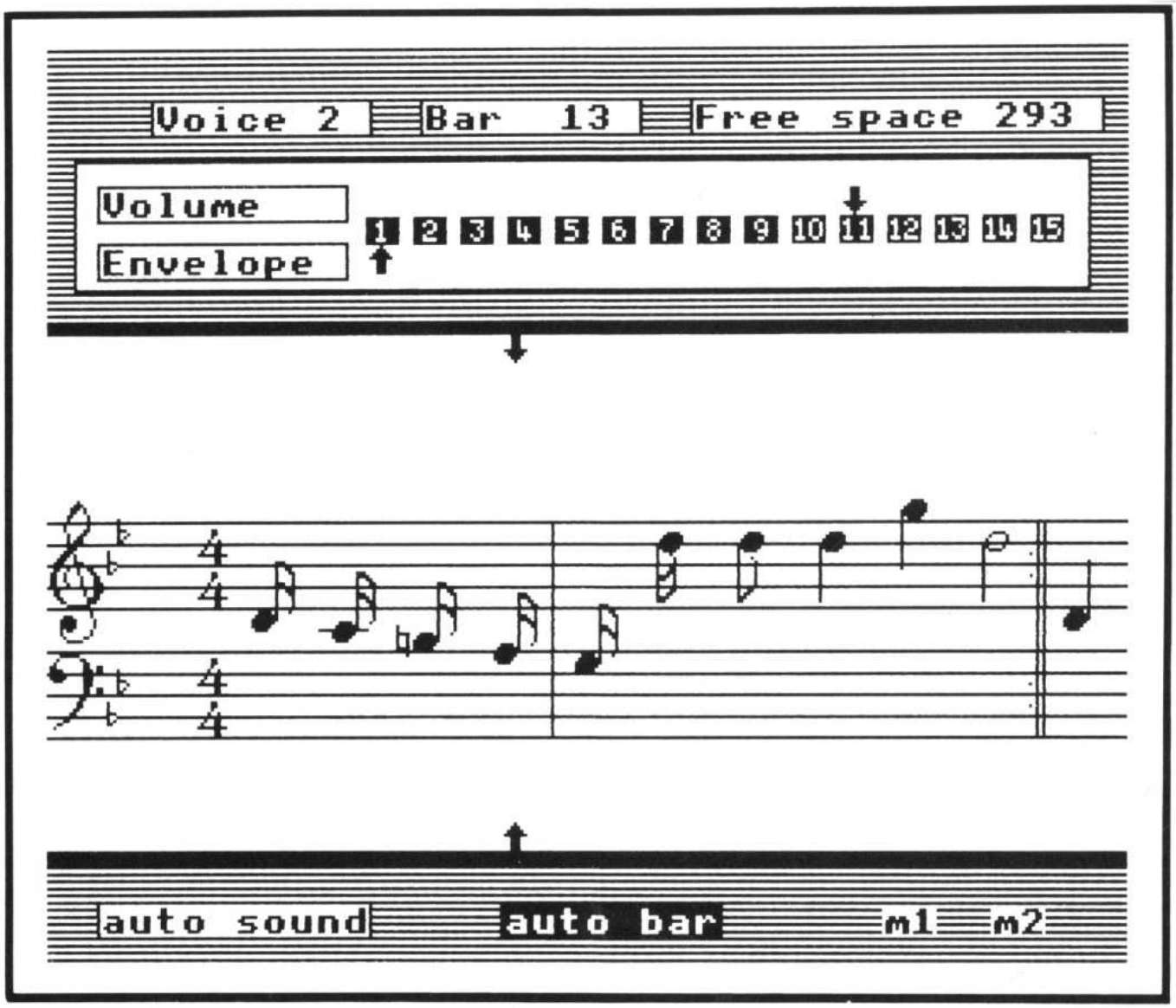
Quite simply, they should be understanding the nature of pitch and duration of notes as well as developing a feeling for rhythm in music.

Possibly the best packages that I have encountered for this region of the curriculum are from System and from Longmans. **Peter Beater's Music Games** by Marion Broadie is a graphically pleasing and educationally sound set of programs which develop concepts of rhythm and pitch. Peter Beater is in fact a character who grew out of Mr T – not the A-Team character, but the little man who was the leader of many of the Good Housekeeping packages before they stopped producing software.

Peter Beater shows the children the Melody Rainbow on which he plays tunes. In one of the exercises the children are encouraged to discover whether notes that he plays are higher or lower. Correct answers attract an appropriate reward. In the Musical Jigsaws part of the game the children are rewarded by the building of pictures drawn from nursery rhymes which then come to life. The animation is excellent and children find it very attractive.

In a further section of the program the children are encouraged to develop their own tunes by guiding Peter Beater in the pitch and duration of notes. These tunes may then be replayed in concert!

The second package which is excellent value and may be seen as complementary to Peter Beater is **Compose** from Longman. This simple and yet technically complex package gives children an environment in which they may gain an understanding of certain music conventions. For example,



most people can recognise an introductory or concluding phrase of music by its form and nature. This software gives children a set of pictures to each of which is attached a musical phrase. By arranging the pictures on the "stave" a tune may be built which will either sound pleasing or otherwise, depending upon the child's understanding of musical form. These lines of pictures may be edited until such time as a successful tune has been created.

The complexity of this package lies in the fact that the teacher can control the amount of information and facilities that are available. So for example he or she may edit the tunes associated with the pictures so that their attributes become different. The number of pictures available at any time may be changed and the child may be guided by a variety of other controls. The beauty of this package is that it is sufficiently simple for even very young children to drive it, andy yet it is powerful enough to satisfy the requirements of a conscientious music teacher.

Addressing the same type of theme as Peter Beater is **Jolly Jack Tar** from Sherston Software. This provides a number of formal exercises in musical principles including rhythm, bars, note values, pitch and music notation at a very elementary level. This pleasing package is very formal in its approach but quite attractive for some youngsters. The package comes complete with a children's book which provides background and a context in which Jolly Jack can teach them some musical principles.

Secondary software

Longman, mentioned earlier, also produce a wide variety of music theory practice programs which are very popular in examination classes in the secondary school. Another source of these is AVP Computing in Chepstow. This article is not designed to address that type of material however. If you are looking for creative material for the classroom the BBC Micro environment is not really one which lends itself too well to that type of activity. There is serious competition from various dedicated music computers – notably the Yamaha – which provide the iser with a much better interface to a wider range of facilities.

Acorn's attempts to produce a music system on the Archimedes have been poor to say the least. Although the principle is good in their **Music Editor** it is severely restricted firstly by the lack of functionality and secondly by the fact that it doesn't work properly! The new 1.2 operating system has done peculiar things to the sound parameters that control the Archimedes' output of music. Consequently, those users who created complex files on the old 0.2 and 0.3 systems will find that, upon loading the tunes into the system, all their instrumentation has gone up the spout! New instruments have to be selected from scratch although the tunes themselves are retained in their original form.

The other major restriction of this editor is the fact that it has no printout facility. Stereo sound with positional placing is all very well, but if you can't print it or, for that matter, import your created sound files into your own programs then, I'm afraid you are wasting everybody's time. Isn't it about time **one** of your packages for the Arc worked correctly?

The teacher's friend

The final part of this article is going to be taken up with an in-depth look at a package which I consider will be of more use to more music teachers than any other I have so far encountered. It is likely to be useful not just in the creation of materials by the teacher but also as a medium for children to make concrete the work that they have been doing.

Music Processor (£49.95) from Mid-Sussex Software is exactly what its title suggests – a processor for music. To make the analogy – most of my readers will have seen a word processor. It is a package which allows words to be entered, edited, formatted and modified and then either saved or printed. A music processor does just the same job. To be honest, I am amzed that no-one has come up with a package as effective as this one before. Even music system is not as easy to drive as this and that was accepted as an unofficial benchmark a long while ago.

Editing and creation of printed music is not particularly simple because so many variables are involved. Whereas text tends to stay in coherent lines, music notation bobs about on the stave and takes so many forms based on a few generic principles that a package which can cope with them all is doing well. Mid-Sussex have produced this one because they had a need – doesn't most of the best software evolve in this way. They are music publishers themselves and they needed a simple means of creating printed music for sale to schools – yes, you have heard of them before! If you do have any of their material, the chances are that it has been created using the Music Processor.

Now if you like packages that have all the bells and whistles and fancy bits then Music Processor is going to come as a big disappointment. The screen display is basic to say the least. White on black with a minimum of prompts – too few on some occasions – and a minimal user interface. Looking at the sophistication of the program I imagine this is because there was just no space to add in any trimmings. Although I can think of a thousand improvements that I would make to the program I have no intention of mentioing any ere because the program works adequately exactly as it is. Once you are familiar with its method of operation you will wonder how you survived without it!

The menu offers you the ability to enter music in a number of forms – either as a single part or as a score. The score may be of any number of parts up to eight. You are also offered the option to edit any of your files, to print a file and to transpose a file. The clever part of this package is the fact that if you have a score which contains for the sake of argument, six parts – perhaps the score for the new school musical, then you may abstract one of those parts **as a separate file** and transpose if for a B-flat clarinet for instance. It may then be re-integrated with the main score. In this way you can write a basic piano score and then modify parts of it for the relevant instruments in your school orchestra.

The only part of normal music notation that is not supported by this package is the range of italian commands which control the mood of the music. Mid-Sussex get over this by including with the package a set of rub-down materials which may be applied to your finished manuscript.

In common with any processor, it is possible to insert new notes, edit existing ones, add all the accotrements of the music stave such as accidentals, dotted notes, rests, quaver, semi and demi-semiquaver beams and all the relevant barlines and repeats. As may be seen from the accompanying table of keystrokes for the package, the company have thought of most options and kept them simple. A typical creation session goes something like this:

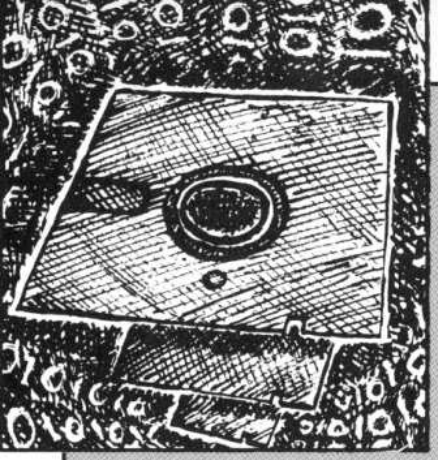
Enter title, composer etc; select the number of staves required and position them on the screen – approximately half an A4 page is represented there; assign clefs and time signature and then begin to enter notes. This process is relatively simple. The arrow marker shows the point at which the notes are being placed; the user selects the note name – for example "A", presses the key which places an A on the stave. The position of this will depend upon the position of the previous note. If the user wishes to move the note up or down an octave then this is easily achieved. Similarly, the placing of the note's stem may be modified and the beams across from one quaver to another may then be placed. Once the user is satisfied, space is pressed and the next note entered. With practice, this process becomes quite rapid.

Once the stave is complete, it is unlikely that it will fit exactly into the space that was provided. The whole stave may then be either compressed or expanded to accommodate the music. This formatting process not only tidies the notes within the bars but also makes the whole stave look more coherent. To be fair, this process is not always as reliable as one might hope and the end results are occasionally puzzling. For this reason, it is always advisable to save your work before reformatting.

Music Processor is probably one of the most useful packages that you can find for the standard BBC B in the music classroom and I would recommend its purchase by all schools – both secondary and primary. It will take the users some time to get used to it and it does have its "features" but it generally will be so useful that you will be able to forgive it!

Factfile

System Software, Fifth Floor, Sheaf House, Sheaf St, Sheffield S1 2BP
Longman Software, Burnt Mill, Harlow CM20 2JE
AB European, Wharfdale Road, Pentwyn, Cardiff CF2 7HB
Electromusic Research, 14 Mound Close, Wickford, SS11 8HG
Mid Sussex Software, 11 Bridle Way, Pound Hill, Crawley RH10 4HP



POINT DUTY

Let A&B Point the way with our Archimedes Pointer Editor!

Phil Colmer

This is a simple but powerful pointer editor for use with the Archimedes. Part of the power of the new Archimedes series is supplied by the VIDC chip which, amongst other things, creates the pointer.

This is a redefinable object which can be up to 32 pixels by 32 pixels in size, made up from any 3 of the 4096 possible colours, regardless of what mode you are in and the current logical colour definitions.

The palette editor in the desktop allows you to redefine the pointer colours easily but does not provide a facility to edit the shape of the pointer. VIDC actually has the capacity for four pointers and once defined, it is very simple to switch between them. The pointer editor allows you to edit a pointer and display it.

You can save and load a definition and export the necessary data block as a text file for including in a program. If a file exists on the current filing system called &.!Palette then this will be used, thus allowing you to check the visibility of the mouse against the defined logical colours. If the palette file cannot be found then the program will try to use the desktop palette (if the desktop is held in ROM), otherwise the program will stop.

The program temporarily makes logical colours 1 to 3 the same as the three mouse colours while you are editing a definition. If you display the edited pointer by pressing the middle mouse button then the logical colours will be restored to their proper values. The background colour (logical colour 0) is used to represent the transparent colour.

On running the program, you will be presented with five options at the right hand edge of the screen, a 16 by 16 grid on the left hand side of the screen and 16 coloured blocks along the bottom of the screen. The options are selected by moving the pointer over the text so that it is highlighted and pressing the left hand button. If you press the middle button, the new pointer shape will be displayed until you release it.

Options

The first option is **EDIT**. While you are editing, pressing the middle mouse button will result in the new pointer shape being displayed until you release the button. This allows you to move the new pointer shape over the coloured blocks to check things like visibility. If you place the pointer over a cell in the grid, then the following operations can be performed:

Pressing the left hand button on its own results in the colour of that cell being cycled through. If the left hand button is held down then the colour displayed in that cell is held and may be copied to another cell by moving the pointer to that cell and pressing the middle button – while still holding down the left hand button. Pressing the right hand button will quit you from editing.

The LOAD Option

The second option is **LOAD**. On selecting this option, you will be prompted for a filename. If you press <Return> on its own, the option will be cancelled.

If you enter a filename then the program will check it's validity as a pointer definition file before loading it. This is done on the basis of the filetype. The filetype I have given P.D.Fs is &0AB.

Provided that the file is valid, the definition will be loaded and the pointer displayed on the grid.

The SAVE Option

On selecting this option, you will be prompted for a filename. If you press RETURN on its own, the option will be cancelled. If you enter a filename then the program will save the definition of the pointer in the file.

The Export Option

This allows you to convert the pointer shape into a series of hex digits for inclusion into another program. To make this option more versatile, you may put a string before and after each hex digit. In addition, you may specify how many digits form a group and put a string before and after each group. For example, given the following Pascal declaration of a variable:

```
VAR pointer : ARRAY [0..15] OF PACKED
ARRAY[1..16] OF CHAR;
```

you may give the following answers to the program to generate a suitable export file:

```
Group prefix: pointer[%] := '
Group suffix: ';
Byte prefix : √
Byte suffix :
# in group : 4
```

The percent sign in square brackets means "substitute group number here", thus generating pointer[0], pointer[1], pointer[2], etc. Note, that for this to work, the program must be compiled with the -SLASH option so that √**dd** is converted to the character whose ASCII code in hex is **dd**.

Alternatively, if you are writing a program in BASIC, you may want the values held in DATA statements:

```
Group prefix: DATA
Group suffix:
Byte prefix : &
Byte suffix : ,
# in group : 8
```

or, if you have defined a block of memory ready for the SWI call, you can have it filled automatically. Suppose the block of memory is called pointer:

```
Group prefix:
Group suffix:
Byte prefix : pointer?%=&
Byte suffix : :
# in group : 8
```

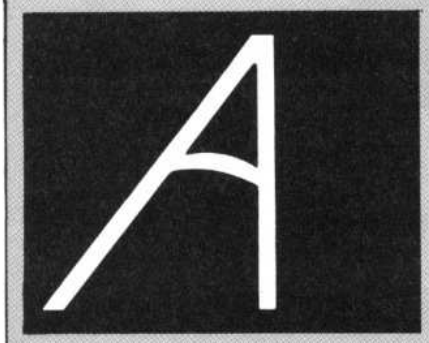
Once again, the percent sign means substitution – but this time for the byte number and not the group number. Although we don't have any group strings defined, there are 8 bytes in a group to create 8 definitions to a line.

The EXIT Option

The fifth and final option is **EXIT**. Simply select this option to leave the program. There are a couple of features which have not been implemented but could be with relative ease due to the variables defined and the code structure:

- At the moment, a 16 by 16 pixel pointer is assumed. This is because that is the size of the default arrow pointer. The data files created start with the width and height of the pointer in pixels and all of the routines which access the data use the variables width and height. Thus, a facility to manipulate the size of the pointer could be incorporated.
- Although the palette editor in the desktop allows you to edit the three pointer colours, it is possible to see only two of them. It would be useful to be able to edit the three colours from within the pointer editor.

Hopefully, using this program will produce some varied and interesting new pointers. Further information on pointers and the related SWIs can be found in the *Programmer's Reference Manual* (and in our ongoing series on ARM Assembly Language Programming – Ed).



```
" 10REM > DefPntr
  20REM
  30REM Written by Philip J C
olmer, <C>A&B 1988
  40REM
  50MODE12:OFF
  60DIM block 9, data 1024, p
alette 60
  70REM initialise pointer &
turn it off ...
  80*POINTER
  90*FX106,0
 100REM try to use palette fi
le on current media
 110REM if not present, try t
o use desktop palette
 120REM if not present, stop
 130IFNOT(FNpalette("&.!Palet
te")) THEN
 140 SYS"OS_FSControl",13,21
TO ,,deskfs%
 150 IFdeskfs%<>0 THEN
 160  c%=FNpalette("-DESKFS-&
.!Palette")
 170 ELSE
 180  ERROR 0,"Must have a !P
alette file"
 190 ENDIF
 200ENDIF
 210width=16:REM pixels
 220height=16:REM pixels
 230y_size=924 DIV height:REM
 calculate optimum size of blo
ck
 240x_size=y_size DIV 2  :REM
 for this size pointer
 250REM initial x & y coordin
ates for pointer in
 260REM menu, edit & display
modes
 270mx%=0:my%=0:ex%=0:ey%=0:d
x%=185:dy%=68
 280FORi%=0TO1023:data?i%=0:N
EXT:REM initialise data block
 290REM initialise screen & t
urn pointer back on
 300PROCinitialise:*FX106,1
 310REPEAT
 320 option%=0:PROCinit_menu:
REM set bounding box & pointer
 position
 330 REPEAT
 340  REM indicate currently
pointed option
 350  PROCinverse(option%=1):
PRINTTAB(70,0);"Edit"
 360  PROCinverse(option%=2):
PRINTTAB(70,2);"Load"
 370  PROCinverse(option%=3):
PRINTTAB(70,4);"Save"
 380  PROCinverse(option%=4):
PRINTTAB(70,6);"Export"
 390  PROCinverse(option%=5):
PRINTTAB(70,8);"Exit"
 400  MOUSE mx%,my%,b%
 410  REM determine currently
 pointed option
 420  REM note that it is not
 necessary to check the x posi
tion
 430  REM as this is restrict
ed by the bounding box
 440  IF(my%>992) THEN option
%=1
 450  IF(my%>933) AND (my%<95
8) THEN option%=2
 460  IF(my%>867) AND (my%<89
7) THEN option%=3
 470  IF(my%>803) AND (my%<83
3) THEN option%=4
 480  IF(my%<768) THEN option
%=5
 490  REM if middle button pr
essed, switch to display mode
 500  IFb%=2 PROCdisplay:PROC
init_menu
 510 UNTILb%=4
 520 REM wait for left hand b
utton to be released
 530 REPEAT
 540  MOUSE mx%,my%,b%
 550 UNTILb%=0
 560 IFoption%=1 PROCedit
 570 IFoption%=2 PROCload
 580 IFoption%=3 PROCsave
 590 IFoption%=4 PROCexport
 600UNTILoption%=5
 610MODE12
 620END
 630:
 640DEFPROCinitialise
 650REM initialise screen
 660LOCAL i%,x%,y%
 670IFwidth*height>1024 ERROR
 0,"Size of pointer is too lar
ge"
 680REM draw coloured boxes a
long bottom of screen
 690FORi%=0TO15
 700 GCOL i%
 710 RECTANGLE FILL i%*80,0,8
0,80
 720NEXT
 730REM draw edit grid
 740FORx%=0TOwidth
 750 MOVEx%*x_size,100:DRAWx%
*x_size,height*y_size+100
 760NEXT
 770FORy%=0TOheight
 780 MOVE0,y%*y_size+100:DRAW
width*x_size,y%*y_size+100
 790NEXT
 800REM read data block and d
raw pattern of edited pointer
 810x%=0:y%=height-1
 820FORi%=0TOwidth*height/4-1
 830 v%=data?i%
 840 FORj%=1TO4
 850  GCOL (v% AND 3)
 860  RECTANGLE FILL x%*x_siz
e+2,y%*y_size+104,x_size-4,y_s
ize-8
 870  v%=(v% >>2):x%+=1
 880 NEXT
 890 IFx%=width x%=0:y%-=1
 900NEXT
 910ENDPROC
 920:
 930DEFPROCexport
 940REM produce a text file f
rom pointer definition
 950LOCAL f$, gp$, gs$, bp$,
bs$, gn%, gc%, total%, index%,
 t$, c%
 960LOCAL gcount%, bcount%
 970PROCcon_poff:INPUTTAB(30,
0);"Filename: "f$
 980IFf$<>"" THEN
 990 INPUT LINE TAB(30,1);"Gr
oup prefix: "gp$
 1000 INPUT LINE TAB(30,2);"Gr
oup suffix: "gs$
 1010 INPUT LINE TAB(30,3);"By
te prefix: "bp$
 1020 INPUT LINE TAB(30,4);"By
te suffix: "bs$
 1030 INPUTTAB(30,5);"# in gro
up: "gn%
 1040 PROCcoff_pon:c%=OPENOUT(
f$)
 1050 total%=width*height/4:in
dex%=0:gcount%=0:bcount%=0
 1060 REPEAT
 1070  gc%=0
 1080  BPUT#c%,FNgeval(gp$);
 1090  REPEAT
 1100   t$=STR$~(data?index%)
 1110   IFLEN(t$)<>2 t$="0"+t$
 1120   BPUT#c%,FNbeval(bp$);
 1130   BPUT#c%,t$;
 1140   BPUT#c%,FNbeval(bs$);
 1150   index%+=1
 1160   gc%+=1
 1170   bcount%+=1
 1180  UNTILgc%>=gn%
 1190  BPUT#c%,FNgeval(gs$)
 1200  gcount%+=1
 1210 UNTILindex%>=total%
 1220 CLOSE#c%
 1230ENDIF
 1240PROCcoff_pon
 1250PRINTTAB(30,0);SPC(10+LEN
(f$))
 1260PRINTTAB(30,1);SPC(40);
 1270PRINTTAB(30,2);SPC(40);
 1280PRINTTAB(30,3);SPC(40);
 1290PRINTTAB(30,4);SPC(40);
 1300PRINTTAB(30,5);SPC(40);
 1310ENDPROC
 1320:
 1330DEFFNgeval(s$)
 1340REM perform group evaluat
ion of s$
 1350REM if % found, convert t
o value of group count
 1360LOCAL p%, t$, exit%
 1370t$="":exit%=FALSE
 1380REPEAT
 1390 p%=INSTR(s$,"%"):IFp%=0
p%=LEN(s$)+1:exit%=TRUE
 1400 t$=t$+LEFT$(s$,p%-1):s$=
MID$(s$,p%+1)
 1410 IFNOT(exit%) t$=t$+STR$(
gcount%)
 1420UNTILexit%
 1430=t$
 1440:
 1450DEFFNbeval(s$)
 1460REM perform byte evaluati
on of s$
 1470REM if % found, convert t
o value of byte count
 1480LOCAL p%, t$, exit%
 1490t$="":exit%=FALSE
 1500REPEAT
 1510 p%=INSTR(s$,"%"):IFp%=0
p%=LEN(s$)+1:exit%=TRUE
 1520 t$=t$+LEFT$(s$,p%-1):s$=
MID$(s$,p%+1)
 1530 IFNOT(exit%) t$=t$+STR$(
bcount%)
 1540UNTILexit%
 1550=t$
 1560:
 1570DEFPROCsave
 1580REM save pointer definiti
on in compressed form
 1590REM (4 pixels per byte) t
hen set filetype
 1600LOCAL c%, f$, i%
 1610PROCcon_poff:INPUTTAB(30,
0);"Filename: "f$:PROCcoff_pon
 1620IFf$<>"" THEN
 1630 c%=OPENOUT(f$)
 1640 BPUT#c%,width
 1650 BPUT#c%,height
 1660 FORi%=0TOwidth*height/4
 1670 BPUT#c%, data?i%
 1680 NEXT
```

```
 1690 CLOSE#c%
 1700 OSCLI"SETTYPE "+f$+" 0AB
"
 1710ENDIF
 1720PRINTTAB(30,0);SPC(LEN(f$
)+10)
 1730ENDPROC
 1740:
 1750DEFPROCload
 1760REM check that specified
file is of type &0AB
 1770REM then load data into a
llocated block of memory
 1780LOCAL i%, c%, f$
 1790PROCcon_poff:INPUTTAB(30,
0);"Filename: "f$:PROCcoff_pon
 1800IFf$<>"" THEN
 1810 SYS"OS_File",5,f$ TO ,,R
2
 1820 IF(R2 AND &FFF00000)<>&F
FF00000 PROCinvalid:ENDPROC
 1830 i%=(R2 AND &FFF00)>>8
 1840 IFi%<>&AB PROCinvalid:EN
DPROC
 1850 c%=OPENIN(f$)
 1860 width=BGET#c%
 1870 height=BGET#c%
 1880 FORi%=0TOwidth*height/4
 1890  data?i%=BGET#c%
 1900 NEXT
 1910 CLOSE#c%
 1920 CLS:PROCinitialise
 1930ELSE
 1940 PRINTTAB(30,0);SPC(9)
 1950ENDIF
 1960ENDPROC
 1970:
 1980DEFPROCinvalid
 1990VDU7
 2000PRINTTAB(30,0);"Not a poi
nter data file - press a key"
 2010REPEAT UNTIL GET
 2020PRINTTAB(30,0);SPC(40);
 2030ENDPROC
 2040:
 2050DEFFNpalette(f$)
 2060REM attempt to load named
 file into allocated block of
memory
 2070REM define colours as spe
cified by palette values
 2080REM except that logical c
olours 1-3 are defined as
 2090REM mouse colours 1-3
 2100LOCAL flags%, i%
 2110SYS"XOS_File",255,f$,pale
tte,0 TO ;flags%
 2120IF(flags% AND 1)=1 THEN =
0
 2130PROCp(palette,0,16):REM d
efine background
 2140FORi%=1TO3
 2150 PROCp(palette+48+i%*3,i%
,16):REM define l1-3 as mouse
colours
 2160 PROCp(palette+48+i%*3,i%
,25):REM define mouse colours
 2170NEXT
 2180FORi%=4TO15
 2190 PROCp(palette+i%*3,i%,16
):REM define remaining logical
 colours
 2200NEXT
 2210PROCp(palette+48,24,24):R
EM define border colour
 2220=1
 2230:
 2240DEFPROCp(p%,c1%,c2%)
 2250LOCAL r%, g%, b%
 2260r%=?p%:p%+=1
 2270g%=?p%:p%+=1
 2280b%=?p%
 2290VDU19,c1%,c2%,r%,g%,b%
 2300ENDPROC
 2310:
 2320DEFPROCinverse(c%)
 2330IFc% COLOUR0:COLOUR135 EL
SE COLOUR7:COLOUR128
 2340ENDPROC
 2350:
 2360DEFPROCedit
 2370REM edit pointer definiti
on
 2380REM if left hand button p
ressed, adjust setting of pixe
l
 2390REM if middle button pres
sed, display pointer
 2400REM if right hand button
pressed, return to menu mode
 2410LOCAL b%
 2420PROCinit_edit
 2430REPEAT
 2440 MOUSE ex%,ey%,b%
 2450 x1%=ex% DIV x_size
 2460 y1%=(ey% - 100) DIV y_si
ze
 2470 IFb%=4 PROCset(x1%,y1%)
 2480 IFb%=2 PROCdisplay:PROCi
nit_edit
 2490UNTILb%=1
 2500ENDPROC
 2510:
 2520DEFFNread(x%,y%)
 2530REM return colour of pixe
l specified by x & y position
 2540REM determined by extract
ing significant bits from memo
ry
 2550LOCAL value, temp, shift
 2560value=?FNloc(x%,y%)
 2570shift=(x% MOD 4)*2
 2580temp=((value AND (3 << sh
ift)) >> shift)
 2590=temp
 2600:
 2610DEFPROCwrite(x%,y%,v%)
 2620REM write given value int
o correct bits as specified by
 2630REM x & y position
 2640REM update colour of pixe
l at that position
 2650LOCAL value, temp, shift
 2660value=?FNloc(x%,y%)
 2670shift=(x% MOD 4)*2
 2680temp=(value AND (3 << shi
ft))
 2690value=value - temp + (v%
<< shift)
 2700?FNloc(x%,y%)=value
 2710GCOL v%
 2720RECTANGLE FILL x%*x_size+
2,y%*y_size+104,x_size-4,y_siz
e-8
 2730ENDPROC
 2740:
 2750REM calculate the address
 containing the pixel at x,y
 2760DEFFNloc(x%,y%)=data+((he
ight-1)-y%)*width/4+(x% DIV 4)
 2770:
 2780DEFPROCset(x%,y%)
 2790REM change the colour of
the pixel at x,y
 2800REM if the middle button
is pressed while the left hand
 2810REM button is held down,
then set the selected pixel
 2820REM to the same colour
 2830REM exit when all buttons
 are released
 2840LOCAL q%, w%, e%, f%
 2850temp=(FNread(x%,y%) +1) M
OD4
 2860PROCwrite(x%,y%,temp)
 2870REPEAT
 2880 MOUSE q%,w%,e%
 2890 x%=q% DIV x_size
 2900 y%=(w% - 100) DIV y_size
 2910 IFe%=6 PROCwrite(x%,y%,t
emp)
 2920UNTILe%=0
 2930ENDPROC
 2940:
 2950DEFPROCdisplay
 2960REM display the edited po
inter
 2970LOCAL b%
 2980REM define pointer 2 to b
e the edited shape
 2990?block=0
 3000block?1=2
 3010block?2=width DIV 4
 3020block?3=height
 3030block?4=0
 3040block?5=0
 3050block!6=data
 3060SYS"OS_Word",21,block
 3070*FX106,2
 3080REM redefine logical colo
urs 1-3 to be as specified by
the loaded
 3090REM palette values
 3100FORi%=1TO3
 3110 PROCp(palette+i%*3,i%,16
)
 3120NEXT
 3130REM set the bounding box
around the coloured boxes and
wait
 3140REM for the middle button
 to be released
 3150MOUSE RECTANGLE 0,0,1280,
80
 3160MOUSE TO dx%,dy%
 3170REPEAT
 3180 MOUSE dx%,dy%,b%
 3190UNTILb%=0
 3200REM reset logical colours
 1-3 to be as specified by mou
se colours 1-3
 3210FOR i%=1TO3
 3220 PROCp(palette+48+i%*3,i%
,16)
 3230NEXT
 3240REM reselect pointer 1
 3250*FX106,1
 3260ENDPROC
 3270:
 3280DEFPROCcoff_pon
 3290REM turn the cursor off a
nd the pointer on
 3300OFF
 3310*FX106,1
 3320ENDPROC
 3330:
 3340DEFPROCcon_poff
 3350REM turn the cursor on an
d the pointer on
 3360ON
 3370*FX106,0
 3380ENDPROC
 3390:
 3400DEFPROCinit_menu
 3410REM set the bounding box
around the menu and
 3420REM move the pointer to t
he last position used
 3430REM when accessing the me
nu
 3440MOUSE RECTANGLE 1123,734,
157,290
 3450MOUSE TO mx%, my%
 3460ENDPROC
 3470:
 3480DEFPROCinit_edit
 3490REM set the bounding box
around the edit grid and
 3500REM move the pointer to t
he last position used
 3510REM when editing
 3520MOUSE RECTANGLE 0,100,wid
th*x_size,height*y_size
 3530MOUSE TO ex%,ey%
 3540ENDPROC
```

Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774 Tlx: 8956095 Fax: 01 950 8989

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Credit Card Orders (ACCESS & VISA) Tel (0923) 33383 or 50234 (24 Hours)

The choice before and after the experience

Archimedes micro

System	Basic	Mono	Colour
305	£699	£759	£909
310	£829	£875	£1025
310M	£879	£925	£1099
440	£2399	£2449	£2595

(Securicor carr. £10 on Micros)

Archimedes FREE PRINTER OFFER

FREE, £160 worth of Hardware

With every Archimedes Micro purchased from us this month, we are giving away absolutely FREE a Panasonic KX-P1081 Dot Matrix PRINTER and an Archimedes PRINTER LEAD worth £160. If you already own a printer, then simply phone in for alternatives. (P.S. This offer does not apply with 0% finance scheme mentioned in column).

- 0.5 Mb RAM for 305 £149
- Podule Backplane £37
- ROM Podule (Computer Concepts) £48
- ROM Podule (C C) with Battery Backup £59
- ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K) £56
- Archimedes Ref Manual £29
- 2nd 800K floppy disc drive (for 305, 310 & 410) £118
- Econet Network Board £40
- Backplane for 2 podules, with fan (305, 310) £39
- I/O Podule (with User port, Analogue port & 1MHz bus) £85
- MIDI add-on to I/O Podule £38
- MIDI Expansion Card £66
- Real time Video Digitiser (Watford) £249
- Sound Sampler (Armadillo) £105
- 20 Mb Hard Disc & Controller Card £469

WORDPROCESSORS

Wordwise +	£18	Pipedream	£89
Image Writer	£25	View	£49
Interword ROM	£35	Viewspell	£32
1st Word Plus	£79	ViewIndex	£12
Archie Spell Master	£49		

DATABASES

AlphaBase	£39	Viewstore	£49
System's Delta Plus			£60

SPREADSHEETS

Intersheet ROM	£35	Viewsheet	£49

BUSINESS GRAPHICS

GammaPlot	£30	Interchart ROM	£22

INTEGRATED PACKAGES

Logistix – Database, Spreadsheet, Time Management & Business Graphics £95

PC EMULATION Pack

(for 310, 410 & 440), including MSDOS 3.21 £79

GRAPHICS, ART & DESIGN

Interchart	£25	Gamma Plot	£30
Artisan	£31	Gamma Plus	£60
Support Disc	£17	**Autosketch**	£69
Toolkit (Beebug)	£32	Toolkit (Clares)	£31
Arc Termulator	£59	Zarch	£16

LANGUAGES

ANSI 'C'; ISO-PASCAL; FORTRAN 77;	£95 each
Cambridge LISP; PROLOG X	£181 each
Archimedes Assembler	£189
TWIN EDITOR	£27

0% (APR) FINANCE

*For a limited period, Watford Electronics are able to offer the Archimedes range of microcomputers at **0% (APR)** finance. Credit facility available subject to status. Please inquire for further details. (Watford Electronics are Licenced Credit Brokers)*

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

Only £19

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

New

By Popular demand we are now supplying refurbished and fully guaranteed BBC Micro Model B with Disc Filing System

(Please telephone for price & availability)

NEW

Archimedes On-site Maintenance now available

(Please write in for further details)

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price **£175**

CREDIT TERMS now available. Please telephone or write in for further information.

BBC MASTER

MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus £125 worth of FREE OFFER (see below) **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

*Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and **Watford's** 3½", double sided 1 Megabyte (unformated) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

BBC MASTER with Turbo Board + above SPECIAL OFFER £513

512K Processor Add on Board "inc. Mouse and GEM package" £75

BBC MASTER plus 512K 80186 Co-processor Board (incl. Mouse and GEM package) plus the above £105 worth of SPECIAL OFFER £449

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module		£116
Econet Module for the Master		£40
Twin ROM Cartridge for Master		£7.50
Quad ROM Cartridge for Master		£11
Universal Processor Adaptor		£75
Master Reference Manual I	(No VAT)	£14
Master Reference Manual II	(No VAT)	£14
Master Advance Ref. Manual	(No VAT)	£19
64K Upgrade Kit for B+		£32
Acorn 1770 DFS Kit complete		£49
ECONET Upgrade Kit for BBC		£42
ALL ECONET UPGRADES Available		
ARIES' Professional IEEE Interface		£238
Acorn IEEE Interface Complete		£265
Morley Teletext Adaptor with ATS Rom		£99
Filestore E01 £699	Filestore E20	£599
Filestore E01 & E20 together		£999

BBC MASTER COMPACT

System 1	Standard Package	£299
System 1A	System 1 + TV Modulator	£315
System 2	System 1 + Green Hires Monitor	£345
System 3	System 1 + Medium Res Colour Monitor	£469
RS232 Kit for BBC Compact		£25
Additional 3½" Drive for BBC Compact (Securicor carriage £7)		£90

65C102 2nd PROCESSOR

(65C102 replaces the original Acorn 6502 2nd Processor)

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

£159

Z88 Sinclair's Portable Micro

The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

Only: £239

FREE

With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

Mains Adaptor	£8.65
32K RAM Pack or 32K EPROM Pack	£17.35
128K RAM Pack or 128K EPROM Pack	£43.40
512K RAM Pack	£169
Z88 Spellmaster for Pipedream	£51
Z88 to BBC Link	£21.70
Z88 to PC Link II	£30
Z88 EPROM ERASER	£34.75
Serial Printer Cable	£8.65
Parallel Printer Cable	£24.00
Z88 Modem	£145
Z88 Soft Carrying Case	£8.50
Sinclair Z88 Computing Book	£9.95
AA Nicad Rechargeable Battery	£1.50
Battery Charger, Compact & Fast (3 Hours)	£6

CO-PRO Adaptor

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

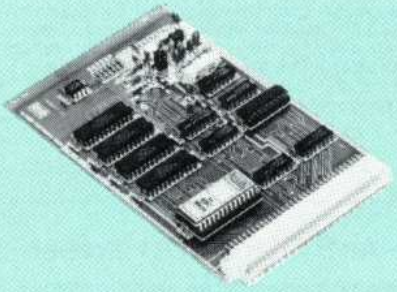
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro to add a second Co-processor externally.

Watford, brings power to your BBC at only:

£35 (carr £5)

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

Cont.

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Watford Electronics are Appointed & Authorised DEALERS / REPAIR CENTRE for Acorn Computers Ltd Microvitec Monitors Panasonic Printers

NEW

BBC PCB DESIGNER

At last! A PCB design package for the BBC Micro that eclipses some industry CAD software. Hard to believe, isn't it? Just look at some of the impressive package specification:

- Library Component Designer
- Component Library (over 200 parts)
- Component List Editor
- NetList Editor
- PCB Board Designer
- Plotter Driver
- Dot Matrix Printer Driver

This integrated suite of programs is packed full of sophisticated PCB related features making the design of a circuit board a dream instead of a nightmare.

Input for the design may be manual or Auto mode.

Some of the PCB Designer's features are:

- Over 120 library pad sizes/shapes
- Four colour adjustable palette
- Zoom range 2:1 to 1:4
- Highlighting of specific tracks
- Normal and surface mounted components
- Rapid screen review
- Menu driven
- Variable gridlock
- Switchable measurement grid
- Pre-select pan/scroll facility
- Large 24" x 24" Board size
- Copy route facility
- Connectivity held at all times
- Ratsnesting of part connections
- Auto-plaement of text references
- Text linked to parts
- Automatic placement of vias
- Printer and plotter outputs provided
- Comprehensive manual

TYPES OF PLOT OUTPUT

Top and bottom track artworks, top and bottom silkscreens, solder resist mask, drilling detail drawing and check plot. All these may be with pad holes on/off, scale of 2:1 or 1:1, board edge on/off, 90 degres rotation, mirror image, width of pen, x & y offsets and batch plots to disc.

The above is only a taste of the superb features of this software, surely capturing previously unknown performance from the BBC Master computer. BBC B owners will need to fit at least one block of sideways RAM, Shadow screen memory and a disc drive. A trackerball or a mouse is also required.

Introductory Offer: £99

(Please write in for further technical details)

Continued

MONITORS & SWIVEL BASES

All Monitors are supplied complete with BBC connecting leads FREE.

MICROVITEC 14"

- 1431 – Standard resolution as used on the BBC television computer programme **£175**
- 1451 – Medium resolution, suitable for word processing in mode 0 **£219**
- 1441 – High res, exceeds the capabilities of the BBC micro **£359**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£255**
- **2030 CS 20" Med Res** **£380**
- **2040 CS 20" Hi Res** **£675**
- Dust Cover for Microvitecs **£5.50**
- **Touchtec 501 Touch Screen** **£239**

TAXAN 12" & 14"

- **TAXAN Super Vision 2 Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing **£263**
- **TAXAN Super 3, Type 625** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£313**
- **TAXAN 14" Multisync 770 Plus** – An autoscanning Ultra high res, colour monitor. Ideal for Archimedes, IBM & Compatibles **£479**

- **NEC JC-1401P3EE 14"** Multisync Ultra Hi-res Intelligent Colour monitor. Auto scans frequencies between 15KHz to 35KHz. Text switch provides 7 colours for Database & wordprocessor. **£475**

PHILLIPS

- BM7502 12" Hi-res Green Monitor **£65**
- CM8833 14" Med. Res Colour Monitor **£219**
- CM8852 14" Med/High Res Colour **£249**
- CM8873 14" High Res Colour Monitor **£475**

STAR BUY

- **PHILLIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £195

Dust Cover for Phillips Monitors **£6**

NEW

SPECIAL OFFER
AMBER MONITOR

BT MERLIN/Acorn 12" Hi resolution Amber monitor. Ideal for wordprocessing. Consealed front panel mounted controls. Illuminated mains on/off rocker switch. Supplied complete with BBC Cable.

Only £49
(Offer valid while stocks last)

N.B. carriage on Monitors **£7** (securicor)

SPARE LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for TAXAN Monitors	**£3**
Archimedes Colour Monitor Lead	**£7.50**

SWIVEL BASES

By placing your monitor on one of our professional swivel bases (see monitors drawing on the left), you gain the freedom to adjust the monitor viewing angle to suit your needs and thus alleviate eye strain and reduce back stress. The front mounted adjustable control dial makes adjusting the monitor viewing angle very simple.

for 12" Monitors **£7** (carr. £2.50)
for 14" Monitors **£10** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

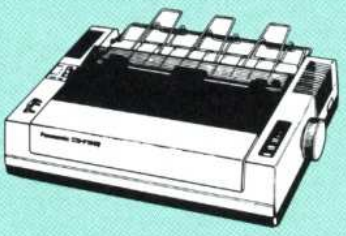
TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column Printerr (carr £7)	**£275**
RS232 Interface	**£49**
RS232 Interface with 2K Buffer	**£69**
RS232 Interface with 16K Buffer	**£89**

Panasonic KX-P1081



Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£145** (carr. £6)
Optional RS232 Interface: **£39**

Panasonic KX-P3131 Daisy-Wheel Printer

Low-cost, high performance; Bi-directional, Logic seeking, Proportional spacing, 10, 12 & 15 CPI, Speed 17CPS. 6K Buffer.

Only **£255** (carr. £7)

Tractor Feed	**£90**
Daisy Wheel (various)	**£12**
Ribbons: Standard **£4.50**; Long Life **£7**	
Extra 32K Printer Buffer (internally fitted)	**£13**

RS-232 GENDER CHANGERS

Male to Female	**£6.95**
Female to Male	**£6.95**
Male to Female	**£6.95**

Panasonic KX-P4450 LASER PRINTER

Latest technology at affordable price. Prints 11 pages a minute, Two A4 size paper bins, Serial & Parallel ports, 512K Buffer – expandable to 1.5Meg, 15 Character LCD Display, Diablo 630, Epson FX-286, IBM Proprinter, HP Laserjet emulations, 5K pages per month duty cycle.

ONLY £1,649

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £269

FREE Price includes a Free BBC Cable.

Cut Sheet Feeder	**£65**
Additional Font Cartridge	**£25**
NEC P2200 Pinwriter Ribbon	**£6**

NEC PINWRITER P6/P7 Plus

The Ultimate matrix Printer for Business.

Some of the features are:

- Print Speed, 265cps in Draft and 90cps in letter quality.
- Inbuilt Tractor & Friction feed.
- A paper park & low tear of facility.
- 20 inbuilt FONTS as standard.
- A Font cartridge facility.
- 8K byte Printer Buffer as standard.
- 24 Pin Printhead
- Colour Option available

P6 Plus 80 columns	**£439**
P7 Plus 136 columns	**£545**
Cut Sheet Feeder	**£125**
Colour Option	**£74**
Serial Interface	**£73**

EPSON PRINTERS

EX800	**£415**	LQ850	**£469**
EX1000	**£569**	LQ1050	**£599**
FX850	**£315**	LQ2550	**£899**
FX1000	**£425**	LX800	**£179**
GQ3500 Laser	**£1249**	SQ2500	**£975**
LQ500	**£285**		

Star LC10 £192 **LC10 Colour £239**

PLOTTERS

Hitachi 672 Colour Plotter	**£475**
Plotmate Plotter A4S	**£379**
Plotmate Plotter A3M	**£549**

CUT SHEET FEEDERS for

EX800 **£149**; EX1000/LQ2550 **£210**; FX800 **£149**; FX1000 **£179**; LQ/LX800 **£139**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175**.

TRACTOR FEED for

EX800/1000 **£85**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£85**; LQ2500 **£195**

ACCESSORIES

- EX800/1000 Colour Option **£55**
- EX800/1000 Colour Ribbon **£18**
- LQ2500 Colour Option **£65**

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	**£32**	RS232 + 2K Buffer	**£52**
IEEE 488	**£40**	RS232 + 8K Buffer	**£79**

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

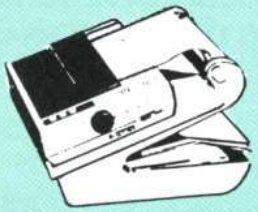
Connects	Serial	Centronics
2 to 1	£22	£23
3 to 1	£30	£32
5 to 1	£40	£42

(Cables extra at £6 each. Please specify type required when ordering)

INTEGREX COLOUR JET PRINTER

- Colour Jet 132 Printer **£515**
- Paper Roll **£6**
- Screen Dump Software **£10**
- Colour Cartridge **£14**
- Black Cartridge **£8**
- 100 A4 OHP transparencies **£55**
- 8K Serial Interface Optional **£99**

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £2.50)
132 Column version £26 (carr. £2.50)

PRINTER LEADS

BBC Centronics 4' long	**£5**
BBC Centronics 6' extra long	**£7**
Compact's Special Centronics Lead	**£7**
Archimedes Printer Lead 1 meter	**£7**
IBM Parallel Lead 1 meter	**£7**
Double Ended 36 way Centronic Lead	**£9**
RS232 Leads (Various)	**P.O.A.**

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	**£3.50**
BBC Master	–	**£4.00**
Archimedes Micro pair	–	**£9.00**
IBM PCs pair	–	**£9.95**
Brother HR15/20	**£3.00**	**£5.00**
DMP2000	**£3.75**	**£4.75**
EX/LQ800	**£4.50**	**£4.50**
EX/LQ1000	**£7.50**	**£5.00**
RX/FX80/85/800/MX80	**£3.90**	**£4.95**
RX/FX100/1000	**£5.75**	–
Kaga/Taxan KP810/815	**£4.90**	**£4.00**
LC10 (Black)	**£4.25**	**£5.00**
LQ500/800	**£3.75**	**£5.00**
LQ1050/LQ2500	**£8.50**	**£5.50**
LX80/86/800	**£3.80**	**£4.50**
M1009/GLP	**£3.80**	**£3.75**
Panasonic KX1080/81	**£4.00**	**£4.75**
SQ2500	**£23.00**	**£5.50**
Star NL10	**£3.75**	**£4.50**
Olivetti Ink Jet Cartridges (set of 4)	**£9**	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

- *1,000 Sheets 9½" × 11" Fanfold Paper* **£7**
- *2,000 Sheets 9½" × 11" Fanfold Paper* **£12**
- *1000 Sheets 9½" x 11" NCR 2 Part Fanfold* **£19**
- *1,000 Sheets 15" × 11" Fanfold Paper* **£9**
- *1000 Sheets true A4 Fanfold Paper* **£11**
- *2000 Sheets true A4 Fanfold Paper* **£19**
- *Teleprinter Roll (Econo paper)* **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	***£5.00***
1,000 90 × 36mm (Twin Row)	***£4.90***
1,000 90 × 49mm (Twin Row)	***£7.50***
1,000 102 × 36mm (Twin Row)	***£6.25***

Carriage on 1,000 Labels £1.00

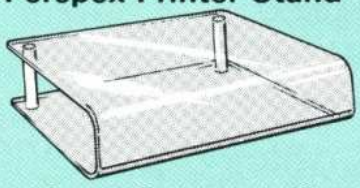
PLINTHS FOR BBC MICRO, MASTER & PRINTERS

Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of coolingslots it has elegant cutouts on the sides. This allows access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	**£12** (carr. £2)
Double BBc Plinth	**£20** (carr. £3)
Printer Plinth	**£12** (carr. £2)
Single Master Plinth	**£13** (carr £2)
Double Master Plinth	**£24** (carr £3)

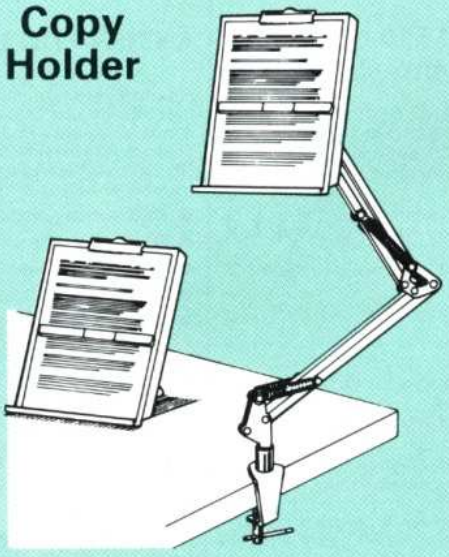
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

MEGABUFFER 256

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £2)

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	**£10**
Colour Ribbon	**£6**
Black Ribbon	**£6**

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

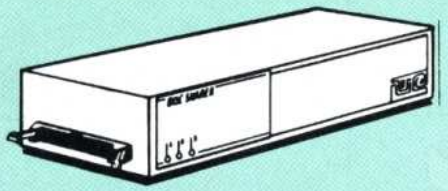
£5.95 (No VAT)

VISA
CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Continued ——→

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£48**
- *Acorn's 0.90 DFS Kit complete* **£49**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** • *ADFS ROM only* **£25**

NEW

Watford's MkII 1770 Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

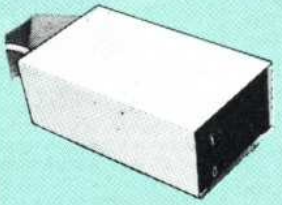
Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Special 40/80 Disc Drive/DDFS Mk II Offer

- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
(Offer valid while stocks last)

3½" DISC DRIVE OFFER



These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- **CLS35 400K Unit** **£69**
- **CLD35 800K Unit** **£126**

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It s recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

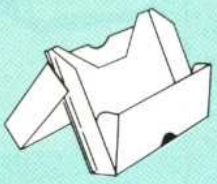
£6

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25*** – holds upto 25 3½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**
- **M10** – holds upto 10 Data Cartridges **£15**

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

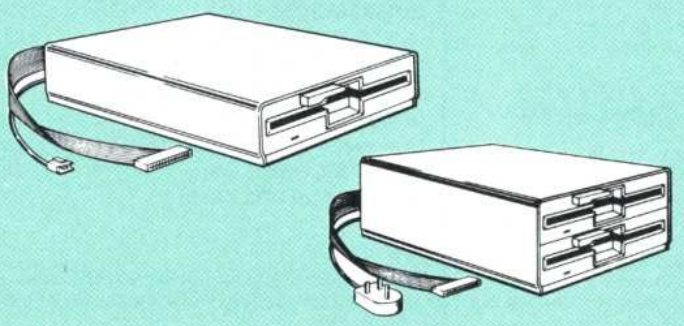
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 4th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £82	CLD 400 £168	CS 400S £92	CD400 £188
800K (1.44M)		CLD 800S £162		CD 800S £182

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5¼" S/S D/D 40 Track Diskettes (744)* ***£6.00***
- *10 × 5¼" D/S D/D 40 Track Diskettes (745)* ***£7.50***
- *10 × 5¼" S/S D/D 80 Track Diskettes (746)* ***£11.50***
- *10 × 5¼" D/S D/D 80 Track Diskettes (747)* ***£11.75***
- *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* ***£19***
- *10 × 3½" S/S D/D 40/80 track Discs* ***£10.00***
- *10 × 3½" D/S D/D 40/80 track Discs* ***£11.75***
- *10 × 3½" High Density Diskettes* ***£37***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

- *10 × **M3** 3½" D/S D/D 80 Track Discs* ***£11***
- *10 × **M9** 3½" Double Side High Density* ***£34***
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* ***£5***
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* ***£7***
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* ***£9***
- **10 × M8 5¼" D/S H/D Hi-Density Discs** **£14**
- *3" Double Sided Discs* ***£3 each***

PRICES SLASHED

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48

WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350**; ● 30 Megabyte **£420**

CDP800S **CDPM800S**

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196
DP35-800 for BBC/Master £165
(For DP35-800S spec. see Page 8 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued

NOMINATED FOR BRITISH MICRO COMPUTING AWARDS 1987

QUEST MOUSE

QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."
". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."
"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program".
The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Col. C.G. Holton, HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

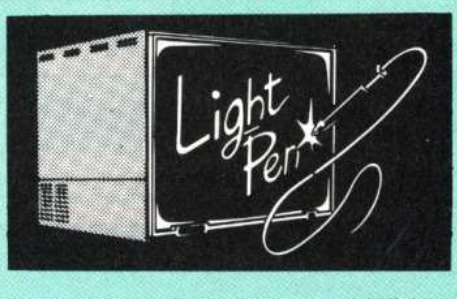
Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	**£54**
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	**£82**
QUEST MOUSE ONLY	**£25**
QUEST PAINT SOFTWARE	**£32**
QUEST FONT DISC	**£12**
ConQuest 32K ROM Package	**£29**
QUEST MAT	**£3**
Part-exchange your old Mouse for a New QUEST MOUSE for only	**£23**
GXR ROM for BBC Micro	**£22**

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£52
RB2 including Quest Paint	£78

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

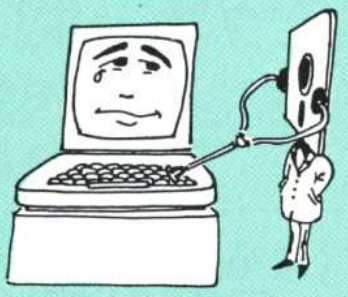
FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£12
AMX DESIGN (ROM)	£55
AMX 3D ZICON Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

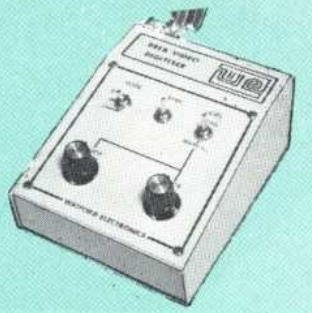
DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

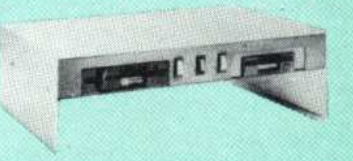
DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

Disc Drives DP35-800S



A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12 **£40**
Aries B-12C **£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

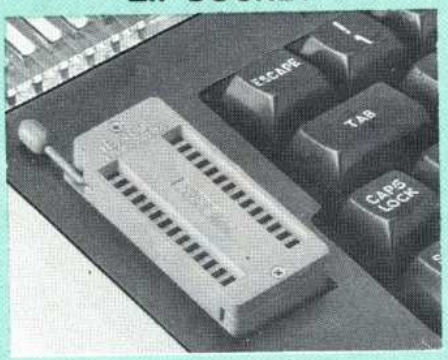
£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only £78

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£16** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

ROM Cartridges for the BBC Master
Twin **£8**; Quad **£12**

16K DISC RAM

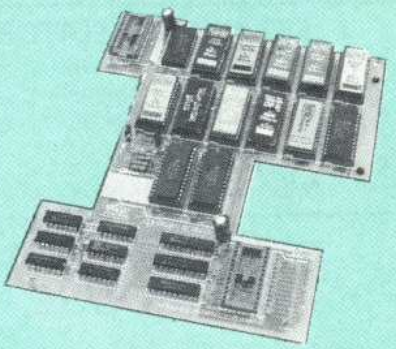
Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- Supplied complete with Battery Backup.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£35** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

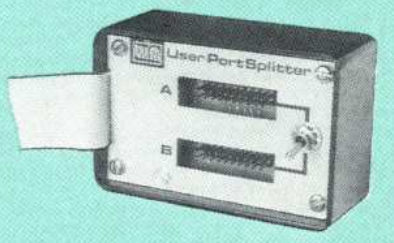
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

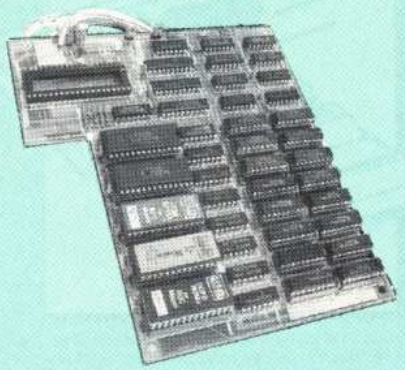
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM ***£48***
- ROM/RAM card with 64k dynamic RAM ***£65***
- ROM/RAM card with a massive 128k dynamic RAM **£109**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£17**
- 16k Dynamic RAM for Upgrade **£17.50**
- Battery backup **£3**
- Read and Write protect switches ..... **£2** each

Complete ROM-RAM board
All options installed **£115**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£82***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
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- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

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Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

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- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
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Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

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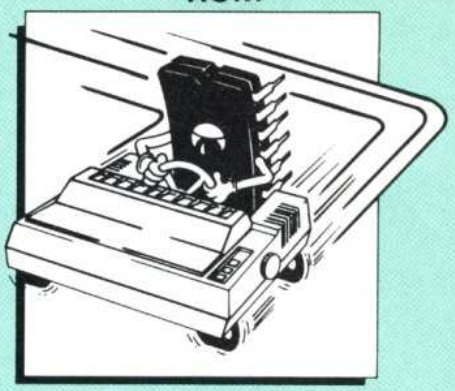
VIEW PRINTER DRIVER for NLQ ROM **£7**

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

ROM-SPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

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Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

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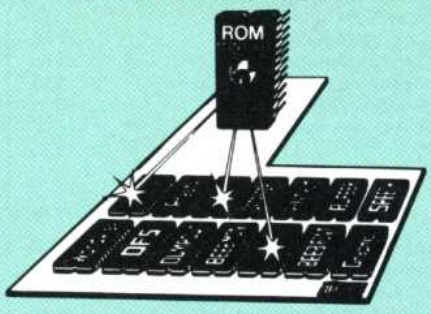

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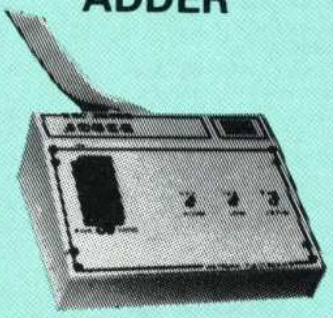

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The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
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- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
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- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

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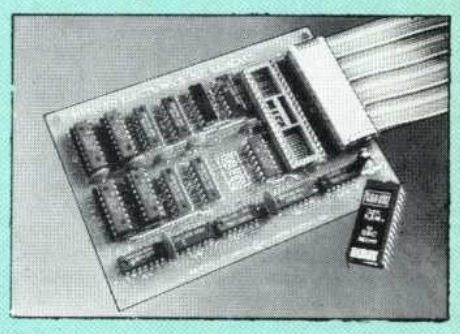
32K
SHADOW RAM-
Printer Buffer
Expansion Board



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Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
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- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
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- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.
- Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

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At the rear of the manual there are pull out circuit diagrams for the Master 128K.
A worth-while addition to any Master owner's library.

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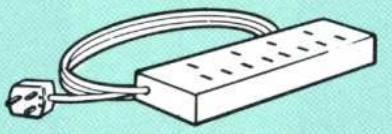

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Badger Micros (Devon), Badger's Hill, Southerton, Ottery-St. Mary, Devon EX11 1SE. Tel: 0395 68516.

Beebug Retail, Dolphin Place, Holywell Hill, St. Albans.

Cambridge Computer Store, 4 Emmanuel St., Cambridge CB1 1NE. Tel: 0223 358264.

Cirkit Distribution Ltd, Park Lane, Broxbourne, Herts.

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HCCS, 575-583 Durham Road, Low Fell, Gateshead, Nr. Newcastle Upon Tyne. Tel. 091 4870760.

Mancomp Ltd, Printworks Lane, Levenshulme, Manchester. Tel: 061-224 1888-9888.

Microman Computers, Pasture Lane Farm, Pasture Lane, Rainford, St. Helens, Merseyside WA11 8PU. Tel: 074488 3667.

The Computer Depot, 205 Buchanan Street, Glasgow G1 2JZ. Tel: 041-332 3944.

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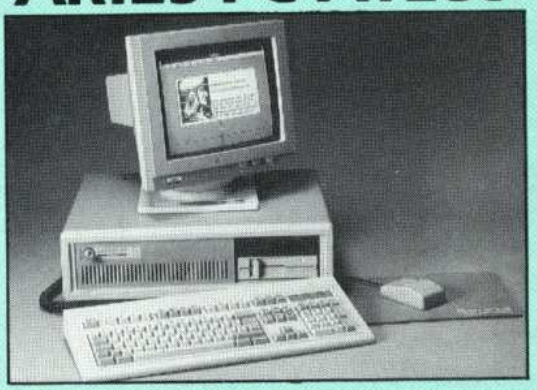
ARIES PC AT286



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Davind Janda

COMMUNICATE

Looking at the latest in Comms, hardware software and... bickering?

Bickering!

Shortly after the great Prestel/Micronet tariff changes, Database Publications, which operates MicroLink on Telecom Gold issued a press release stating that they would not be increasing their prices. Guess what? Yep, shortly after that they have!

The montly standing charge for MicroLink subscribers has gone up from £3 to £5. There's no time charge increase, and MicroLink does not charge for data sent or received to or from the system as is the case with the rest of Gold.

The fact is that just before the increase, Micronet hit back by issuing a press release comparing costs between accessing Prestel/Micronet and MicroLink. A news story also appeared on Micronet which had a go at the MicroLink press release.

Confused? You will be, t he great thing is that there's more. Compunet, an on-line service primarily aimed at Commodore owners also sent out a press release which had a go at the Prestel/Micronet price hike. This one was a bit naughty and seemed to me to be slightly libelous and shortly afterwords a retraction (full of legalese) was issued by Compunet apologising to Micronet.

Besides all this written garbage, your intrepid reporter has also been subject to a great deal of ear bashing from all parties concerned as to who is right or wrong.

Who cares?

Neither you, dear reader, nor I should be subject to this mindless bickering. What would be quite nice is to receive a press release *prior* to a price increase which clearly details the increase, and the reason for it.

I reckon there's little chance of that happening!

BT Loves Micronet

Is there any truth in the rumour that BT is to take complete control over Telemap Group Ltd by buying out the shares which are owned by EMAP and BCE Publitech Ltd (which is a wholly owned subsiduary of Bell Canada Enterprises Ltd)?

According to David Rosenbaum, the PR man at Telemap, there are no such plans, and he catagoricaly denied this.

My spies tell me different though. Anyway, there *is* a difference between owning a company and controlling it isn't there? After all, John Tomany, MD of Telemap Group Ltd, also works for BT, and the product manager for Micronet is employed by BT. Further, Micronet is to move into the Dialcom HQ next year, and there's no prizes for guessing who owns Dialcom.

Where are you?

A new feature on MicroLink enable you to get the corresponding dialling code for a location. Of more use to people with lists of BB numbers, but who haven't got a clue where they are is the facility to find out a location by entering the dialing code.

The system works by entering STD at the cheveron prompt ">". Once done you simple enter a dialling code, or a location and the corresponding info will be displayed in a flash.

BT have a similar facility within their area on the Prestel database. if you enter *BT and take take the route for dialling codes you can then enter the first three digits of a dialling code and it will present you with a list of possible locations. You can dig further and get the local on numbers within major cities as well.

Of course, both these facilities will cost you in terms of online time charges, and the wise comms *cognoscenti* need not pay a penny. How? Simple, get hold of a dialling code booklet which you can get free of charge. Further, once you've found out the location of a number you wish to call you can find out how much the call will cost by using the A-D telephone book.

Within the A-D is a section on national call rates. Simply find the location and the call band will be indicated next to it. Simple!

Not the Alpha Review

This issue was to carry a review of the new Alpha modem from Watford Electronics. Alas this is not the case. A telephone call to a very peeved Nazir Jessa MD of WE revealed that despite passing BABT tests, and an approval number being given there was some paper work which had to be cleared.

The person responsible was on holiday or something like that and as a result everything grinds to a halt as far as the Alpha is concerned. No doubt the modem will be available by the time you read this.

Dataphone dies

That company is, (or was), Peterborough based Dataphone Ltd. The company that produced the Demon II and the excellent Designer modem is no more.

There are a number of factors which contributed to the demise of Dataphone, but one of them is thought to be the delay in obtaining BABT approval for their products.

A new company, **Modem Marketing Ltd** will be supporting Dataphone products from now on.

The sound of music

In keeping with the musical theme of this issue I thought you would like to know just what's going on music wise on the BB front.

Firstly, **Micronet** caters for those with a taste for music to a limited degree. Music City contains hints and tips plus a letters section on all things related to micro music. There is also a selection of telesoftware for BBC Basic, as well as Music 500 and 5000 systems. Each tune costs around 25p – 35p, and in my opinion you'de be a mug if you bought a single one. Why? Because scattered throughout the UK are two networks of BBs aimed at the Beeb user. Called the **Peoples Network** and the **Musictel Network**, both specialise in free music software for the BBC range of micros. Be it Beeb BASIC, Music 500 or the 5000's Studio 5000 environment. These, BBs have got the lot. They've even got the stuff that appears on Micronet!

Piracy! I hear you cry, or is it? Well the people at Micronet are fully aware that "their" music is available on these BBs, yet, to the best of my knowledge, they are doing nothing about it.

I wonder why?

A Hackers tale?

The popular media are again focusing on the issue of hacking after a couple of mega-hacks that have occured over the past year.

The upshot of this is that the public eye is, once again, cast upon that strange band of misfits who sit at terminals all night breaking codes and gaining unauthorised entry into computer systems which are used to run the world.

This, of course is a load of rubbish. The hacking into major computer systems that is. The fact is this; there are very few people who have the ability and the know how necessary to "hack" into any system at all. Most so-called hacks simply consist of people using IDs (mostly demo ones) that were obtained from a BB.

Even the great Prestel hack spawned from someone entering "1234567890" as a ten digit ID was hardly mind boggeling stuff was it?

However, as far as the public at large are concerned, hacking can be likened to some nasty desease. The popular press are still interested in the subject, and when they don't have a story to go on they create one themselves.

One day, not long ago, I received a phone call from a computer trade paper that likes to think it is the Daily Mirror of the computer world. The senior reporter of said paper enquired if I was interested in doing some hacking for them.

Apparently, GEC (a major computer manufacturer) has come up with a security front-end that has yet to be cracked. These front end devices are computers that have to be accessed before the main system itself can be used. They have a number of features including the ability to call back a user, data encryption, call logging, you name it they've got it.

Anyway, the reporter wanted me to hack into a system that was guarded by one of these devices. Furthermore, a quality Sunday paper had approached him and said "Here's the name of one of our reporters, find out all you can about him." Could I help with this as well the reporter wanted to know?

A meeting was set up between myself and the reporter in a central London public house. At this stage I didn't know if this was a trap – (a certain national telephone company has set them up before). Just to be on the safe side I enlisted the aid of fellow A&B brother and part time under-cover agent Darrin Williamson, who, during the day has the exciting job of being assistant editor of this illustrious tome.

The meeting was held, and it turns out that the reporter was genuine – the stories were as well! Equipment as well as locations to work from would be supplied, and I wouldn't even have to touch a keyboard, I could tell someone else what to tap in. I turned down the hacking part not because it's illegal (the fact is the law is still very vague about it), but because it would be too time consuming. Instead, I offered to collaborate on some other features he's working on.

There are a couple of points worth noting from the tale above. Should you ever be approached to hack into a system and you cannot resist the challenge then follow some basic rules:

- Find out who you are working for and why.
- Determine if what you are about to do is legal. Some computer security firms do enlist the help of hackers in order to test the integrity of a system.
- Cover yourself. Get a written guarantee that what you are about to do is not illegal, and that you will in no way be held responsible.
- Use computer equipment and telephone lines other than your own, and *not* at your own premises.
- Get someone else to tap in any keystrokes – remember, you are not a hacker merely a *consultant*.
- Get someone to witness your actions and tell a close friend, even a solicitor what you are up to.
- Get paid in advance – a lot.

There is a thin red line that divides hacking and consultancy and you don't need me to tell you which side of it you should be on. The law in respect to hacking is still very vague, yet do not think that it gives anyone license to "have a go". Gaining unauthorised entry and accessing information held on computers was once concidered a novelty in the states and offenders were let off lightly. This is not the case now, and some people are currently serving some serious time for what could be described as "having some fun".

● Editorial Message

A&B Do not condone the act of computer hacking for illegal purposes, but with any action regarding the use of computer, we want to see it done properly, with no mistakes that could unwittingly cause damage.

And Finally

On a lighter note, I was demonstrating the wonders of Prestel to Clive, the Deputy Ed recently. After conecting to the Prestel computer I entered the ten digit ID of the A&B Computing account and waited for the system to respond, and waited, and waited. Indeed, instead of being presented with ten "-" (one for each character entered) only nine were displayed.

After a while I gave up and entered ***09** to redisplay the log-on page. Lo and behold the screen cleared, and presented on the bottom line was a Prestel page number 9902a. Nothing else would work, so after resetting everything (even the Modem!) I dialled again and the same thing happened!

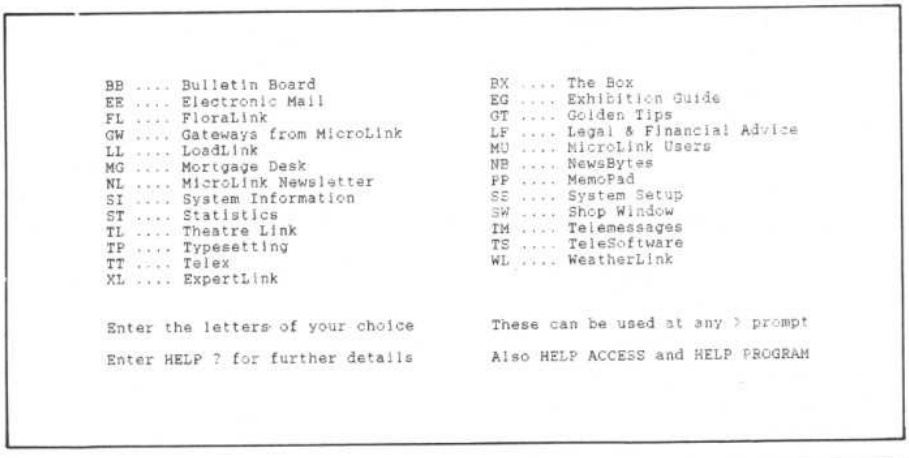
Eventually I got through. Out of curiosity I entered *9902a, and instead of being presented with "**MISTAKE**", or "**PAGE UNAVAILABLE**" we got "**BAD COMMAND**". Just what page 9902 is I don't know, but I do know its on a node used by Prestel. I also know that it's worrying, as Prestel is supposed to be a secure system. Has anyone else had any strange experiences when using the system? Do tell!

Your very own telex

MicroLink can now provide subscribers with their own unique telex number. Prior to this development MicroLink subscribers (as well as those on the rest of Gold and Prestel) used a common number, and any incoming telexes had to have the recipiant's mailbox number in the telex itself.

MicroLink subscribers who wish to have their own telex number should mailbox MAG001, together with a two digit answer-back.

Should you wish to get in contact with me via telex then please feel free to do so, my number is: 9312102295 DJ G.



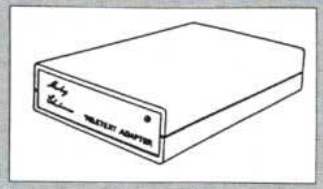
Logging Off

Any news for me? Please feel free to contact me at A&B, or mailbox me on Prestel/ Micronet 011112564, or Telecom Gold/ MicroLink 72:MAG95307.

TELETEXT ADAPTER

Would you like access to free high quality software and over a thousand pages of information, but Prestel access charges and phone bills too expensive? Then read on!
The answer is Teletext. Yes the same system everyone has seen incorporated into television sets, but with a difference. When Teletext is read by a computer you can actually use the data.
The MORLEY TELETEXT ADAPTER introduces you to the world of Teletext at a price that won't break the bank. Inside it you will find the latest in second generation Teletext chip technology, which unlike our rivals who are still using chips designed more than ten years ago, will be fully compatible with any future advances in the Teletext system.
With the Morley adapter you will get a state of the art unit that automatically tunes itself into the required station (no more messing around with screwdrivers or twiddling little knobs in the back of the case), a user friendly menu driven program, easy to follow instructions and a 12 month warranty. Add to this the free downloadable telesoftware and we are sure that you will agree that we are offering you one of the best bargains on the market today.

FEATURES:
* Advanced design uses the latest technology, will handle ANY future enhancements to the Teletext system e.g.: full field; 8 bit data transfer; 2k pages etc.
* Simply plugs into the user port.
* Low power consumption, less than 200ma. Optional power supply available.
* User friendly menu driven software including extended OSCLI and OSWord commands for access from BASIC programs.
* Supplied with 16k ATS (Advanced Teletext Software) and 16k support ROM software inc. printer dumps, page spoolers etc.
* FREE Telesoftware, no access charges (updated weekly).
* Save selected pages to disc/tape for later retrieval.
* Full access to all Teletext services and channels e.g.: CEEFAX, ORACLE, 4-TEL.
* Gives you a real-time clock at your disposal (*TIME).
* Software upgrades to allow for any enhancements to the Teletext service, e.g.: extra channels, full field data on cable & satellite systems etc. (only the media charge).
* Easy to follow comprehensive user guides.
* No hardware limitations, it can for example receive virtually unlimited numbers of channels.
* Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer (no more TV or Radio Times to buy).



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"...In terms of price, performance, future expansion possibilities and those little touches that show thought for the end user I would recommend the Morley unit."–*(Acorn User, January, 1986).*
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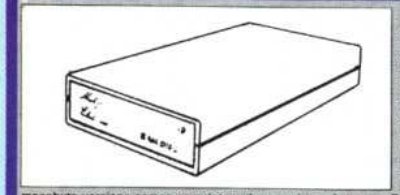
THIS IS THE BIGGEST SELLING TELETEXT ADAPTER CURRENTLY IN PRODUCTION WORLDWIDE, AND COMES WITH A FULL MONEY BACK SATISFACTION GUARANTEE.

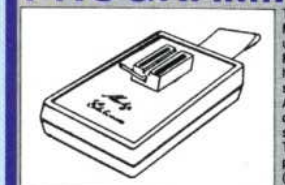
RAMDISC



Now available! The first true MEGA capacity RAMdisc for the BBC, BBC B+ and MASTER computers. This fully compatible unit, currently available in either 1 or 2 megabyte versions comes complete with operating software on ROM, power supply, and a comprehensive user guide.

FEATURES:
One megabyte of RAM connected to the 1mHz bus. Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase of speed, for example, a 20k mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc. The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS). The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive number is 4. Any 'Dangerous' *commands such as *COMPACT, *COPY, *BACKUP etc can be intercepted and the BBC's RAM from page 2 to &7FFF saved to RAMdisc workspace, and may be recovered using a *command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The filing system wedge ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter verifier and 'sector' editor for use with the RAMdisc. Catalogue structure allows up to 2,688 files.
Well that's the spec., add to this our usual 12 month no quibble guarantee and we're sure you'll agree the Morley RAMdisc is the sensible alternative if increased storage capacity and speed is your requirement.

EPROM PROGRAMMER V2



The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.
This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.

THE HARDWARE
The Unit is completely under software control, there are no knobs or switches to baffle the novice, and the extended features provided should excite the pro's.

THE SOFTWARE
The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.
The whole system is available now for less than the price of one WORDWISE chip. So get yourself the all new MORLEY EPROM PROGRAMMER V2 today and start using those expansion boards for what they were made for! ROMS.
Immediate delivery no quibble 12 month guarantee.

MASTER CARTRIDGES

DUALS – Designed and manufactured by Care Electronics to Acorn specifications. These high quality Master expansion cartridges will take two 16k sideways ROM's, and will, unlike similar cartridges available from other manufacturers, accept the new second generation programs, such as Computer Concepts Interword and Spellmaster ROM's.
QUADS – As Duals but take 4×16 Eprom.
These Cartridges come in a high quality, robust, formed-plastic case, that fits neatly into either one of the of Master's cartridge slots.

MASTER SMART CARTRIDGE

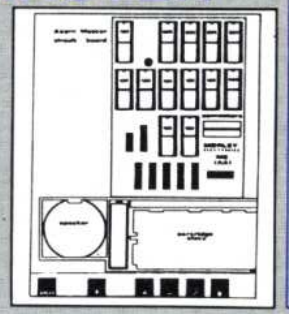
This device was designed and manufactured jointly by Morley and Care Electronics.
The **Smart** cartridge will at the press of a button halt any program running in memory and execute any one of a host of useful built in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination.
The **Smart** cartridge will prove useful to the novice, allowing him to do the simple things like dump any screen to printer, and made backups of protected tape or disc based software, but has an open ended specification for the advanced 'HACKER' allowing advanced programming techniques to be incorporated into almost any program at the touch of a button.

BUILT IN FEATURES (at the press of a button)
Autosaves computer's entire memory.
Freeze program at any point.
Screen dump (any mode) to printer or disc.
Allows any OSCLI command without disturbing memory.
Copies 90% of protected software.
Tape to disc, disc to tape.
User friendly menu.
Sound On/Off.

ALL CARTRIDGES COME WITH A 12 MONTH NO QUIBBLE WARRANTY

NEW PRODUCT

MORLEY MASTER BOARD 'AA'



At long last the add-on all MASTER users have been waiting for, an internal ROM board.

No more need to turn the computer off to insert the cartridge containing the ROM you need to debug the program in memory.

The new **MORLEY MASTER BOARD "AA"** allows you to have up to 8x16k and 4x32k extra Roms installed inside your MASTER and still leaves the cartridge slots free. This in effect allows your MASTER to support as many as 24, 16k ROMs installed permanently, whilst retaining the standard 4 x sideways ram banks and four banks by using cartridges

A staggering 32 ROM images installed and accessible at any time

Included in the package is a utility ROM which has many useful features such as 'FICOPY', a clever file transfer program that transfers files between DFS and ADFS formats or vice versa.

So for less than the price of four external cartridges you get a MASTER BOARD "AA" which with twice the capacity has got to be **THE** ROM expansion for the serious MASTER user.

The unit comes with the usual Morley, full no-quibble twelve months warranty, and our usual after sales service

MORLEY ELECTRONICS

Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne & Wear NE28 6BY
Telephone: Tyneside (091) 2627507
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THE COMPLETE RANGE OF TELETEXT SOFTWARE from M/B SOFTWARE

***NEW . . . DESIGN 7 PLUS** – now 'the best' is even better. Held in high regard by reviewers and hundreds of satisfied owners, DESIGN 7 has been further improved, with revised keystrip & even more features. Design/load/save mnd MODE 7 screen with ease, up to full CEEFAX/Oracle standard. Will convert ANY MODE 7 screen to a BASIC procedure, for inclusion in your own programs. ROM version includes a file copier, printer dumps useable from BASIC etc. B/MASTER/COMPACT.

TELETEXT EMULATORS/SCREEN DISPLAYS/INFORMATION SYSTEMS – A complete range of teletext programs to cater for all needs, with full teletext adapter interfacing.

***NEW . . . DESFAX** – totally new version – streets ahead of the competition – run your own information/display system. Stores hundreds of screens on dual 80 track drives (96 screens on single-sided 40 track), with access to any screen with a SINGLE KEYPRESS. Lots of special effects – screens can scroll, slide, overwrite etc. Animation, loops, subroutines – send for details – not enough space here to even begin to describe the advanced features!! B/MASTER/COMPACT

***NEW . . . MASTERFAX** – 84 MODE 7 screens in memory at once. 148 screens possible with cartridge RAM. An advanced teletext/carousel program featuring SINGLE KEYPRESS or 3-digit page selection. Runs entirely from memory – no disc accesses after pages are loaded. Superb animation and other effects. MASTER/COMPACT only.

***NEW . . . VU-FAX** – 1000 screens and no disc accesses! Screens stored on MORLEY 1MByte RAM DISC. SINGLE KEYPRESS gives instant access to any screen (or emulate teletext). This is the ultimate MODE 7 screen management system – there is nothing else like it. MODEL B/MASTER 128.

***ALSO . . . MASTERcopy** – DFS/DFS, DFS/ADFS, ADFS/DFS, ADFS/ADFS file copier. Uses the MASTER 128's memory to the full to permit fast disc copying. 31 DFS files to ADFS disc in less than 2 minutes. Creates directories automatically. You will wonder how you ever managed without this program. Described by reviewers as 'unexcelled'. MASTER 128 and COMPACT's fitted with DFS ROMS.

ORDER FORM

To order simply complete and return by post enclosing your cheque/P.O. made payable to Morley Electronics, or by phone during office hours, quoting your ACCESS or VISA number.

Morley Electronics, Unit 3 Maurice Road Industrial Estate, Wallsend, Tyne & Wear NE28 6BY Telephone Tyneside (091) 2627507. Telex: 265871 A/B MONREF G (Quoting Mag 70211)

ALL PRICES INCLUDE VAT @ 15%

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Qty. ____	Morley Teletext Compact Version	138.00	(a)
Qty. ____	Optional Power Supply	10.12	(b)
Qty. ____	Teletext Utilities on disc	5.98	(c)
Qty. ____	1 Megabyte RAMdisc	199.87	(a)
Qty. ____	2 Megabyte RAMdisc	349.60	(a)
Qty. ____	Eprom Programmer V2	34.50	(b)
Qty. ____	Master ROM Boards "AA"	46.00	(b)
Qty. ____	Care Master ROM Cartridges	8.97	(b)
Qty. ____	Master Smart Cartridge	39.79	(b)
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Please delete: Adapter software on **ROM/Sideways RAM format**/Software on **40/80 track disc.**

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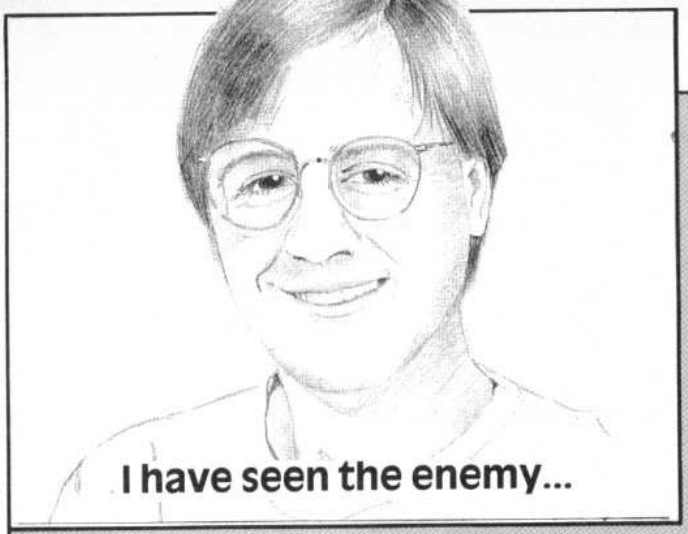

I have seen the enemy...

"At a press launch for IBM PC software last month, we were invited to see and "get hands on experience" of yet another database package for the IBM PC and generic PC clones.

I went along, hoping there would be something to put into the 512 Club, but I came out with a hell of a lot more to think about.

The database was, as you may expect; an overpriced piece of junk – "written in C for speed and flexibility" (a shame as it displayed neither).

The thing was that at the launch, a member of the company approached me and spewed out some of the most incredibly meaningless trash I had ever heard:

For instance, "The power of the IBM PC makes it possible for us to put everything in one program", "The MS-DOS standard is ideally suited to bring out the best in every machine" and "Of course, under emulation, computer systems are possibly *more powerful* when running IBM software".

It seems that the PR comany involved not only enjoyed promoting Junk software, but they were living it as well!

I consider the IBM PC and the MS-DOS format to be the worst enemy to the world of serious computing there has ever been since IBM first started muscling into the then burgeoning microcomputer market. The PC architecture is, as I have said before, the "kludged, inelegant bastard child of the mainframe industry", and I stand by those words. The software is generally not only banal and uninteresting, but it is also the lowest common denominator software running on the lowest common denominator hardware with the minumum of efficiency.

But never mind, companies running business applications have never bothered about that in the past have they? After all, COBOL was (and still arguably is) the *de facto* standard for business programming applications. It compiles like a pig, runs like a tortoise and the quality of the software is similarly trashy.

But never mind, businesses always flock towards standards – they are quantifiable, understandable, you know what you're getting with a PC package, even before you have started investigating the possibility of using it! In short, the software has become as standardised as the hardware it is designed to run on.

The point is that the inclusion of a standard has, in my eyes, put back the world of computing almost a decade. Gone are the days when computer manufacturers started to compete with each other by creating better and faster machines, gone are the days of market superiority through technical excellence (remember that one?), gone are the days of *trying* to produce software that takes a machine to its very limits – oh no, many computer companies are merely happy to hold hands and take a piece of the action – the profits may not be as high, but at least the company is less likely to fail.

So there we have it, computer manufacturers play it safe by producing a machine that is incredibly popular, businesses like the computers because they know what they are getting (by playing safe), software houses are happy because there is a worldwide pool of users – far greater than any other machine so they feel more disposed to write software for these machines, and on the top of the huge stinking dungheap of all this stagnant technology, IBM are just rubbing their hands with glee as they calculate how many PC licences they are selling out!

Everyone is happy that is, until someone tries to make a computer that breaks these rules, a computer that uses technology so new it can still be regarded as experimental, to create a machine that is fast enough to process in orders of magnitude less than its PC counterpart.

IBM have introduced a "sort of" RISC processor in the £15,000 price bracket, it is called the IBM RT, and is currently being incorporated into their "power user" applications. Now there are rumours that IBM are putting forward a proposal to standardize the RISC processor concept, to take it down to its lowest common denominator and call it a "standard" that everone can use *providing* (one assumes) that they buy a license from IBM to use it.

If this is true then we are in for a whole lot of trouble!

If this is to affect the 32 bit architectures such as Acorn's ARM and the parallel processors (such as the Transputer) then we might as well all just give up now. The situation will be ludicrous where we have powerful processors *slowed down* to fit a unifying and homogenous standard, where processor densities are "hobbled" to fit only into 2 or 4 microns – the Jihad-like spread of technology will be limited to the strict religious codes of supply and demand, but only through IBM's licensing.

But this trend is spreading; IBM's only real PC competitor is the Apple Mac, it is irreverently different, it attempts to use the 68000 processor to the full and it tries to squeeze every last bit of addressable memory (and some extra!) by clever programming and a (formerly) original user interface. But that was four years ago, it is nearly the end of 1988 and what do we find? The Commodore Amiga and the Atari ST come on the scene to take a piece of the Mac's action! – If you stripped down these machines, you would find their architectures alarmingly similar!

So perhaps the enemy isn't IBM, perhaps it isn't their forcing the MS-DOS standard, perhaps it isn't the "follow the leader attitude", perhaps it isn't their desire to lower microcomputers down to their "lowest common denominator".

The enemey is more likely to be mankind's desire to sit back and watch the money trickle in, perhaps it is the "piece of the action" mentality creeping into the industry, perhaps we all want an easy life and IBM represent that goal, no matter how damaging it is to the future of the industry.

I have seen the enemy, and it is us.

Clive Grace, A&B Computing."

Archimedes Users!

Q: Which magazine has published 114 technical articles, 56 review articles and 197 different hints & tips – all specifically about the Archimedes?

A: ***Archive Magazine***, Volume 1 (12 issues)

Don't miss out any more – subscribe now...

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Or ring **Eureka!, the Archimedes Bulletin Board** on 0603–250689, V21/V23, Scrolling or Viewdata.

Overseas Prices	Europe	Mid. East	America/Asia	Aust/N.Z.
Volume 1	£18	£20	£22	£24
Volume 2	£20	£24	£27	£29

Payment by sterling cheque drawn on a UK bank or sterling Eurocheque.

Archimedes COMPUTING

Art bargain

£17.95 is not a lot to pay for an Archimedes package but then *Leonardo* from *Beard Technology* needs some strong selling points as it tries to make headway in the "paintbox" market against the likes of Clares. The current Leonardo is a 16 colour package with the standard drawing features, programmable function keys, compressed screen save and an "undo" on A310. Despite the price it looks under-specified.

Perhaps a more credible development will be the promised Leonardo 256, Mode 12 256 colour paint software with font generator and printer dump. *Fairhurst Instrument's Arctist* has already broken the 256 colour barrier and *Clares' Artisan Professional* undoutedly will do so. That font generator sounds interesting though and the price (promised to be under £20) will remain very competitive.

Details from Beard Technology, 111 Evering Road, London N16 7SL ☎ 01 806 4460.

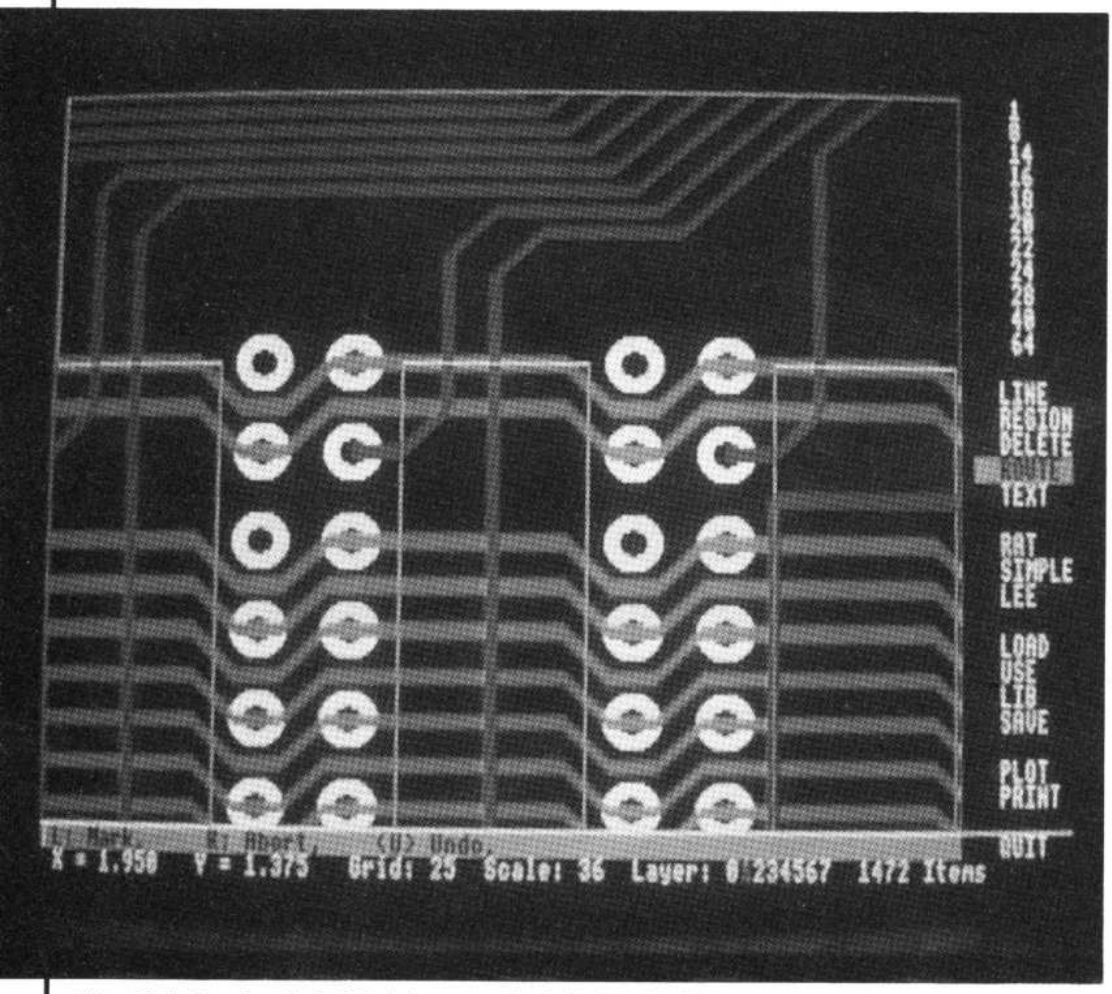
Bomb The Base!

Regular readers of A&B will no doubt be aware of Dabs Press. Their great utility software and reference manuals for both the Beeb and the Arc have been the aspirin for all manner of computing headaches.

Now the boys have turned their attentions to the somewhat spartan world of Archimedes games which until now has been has been inhabited and dominated by Superior and Minerva. Will Dabs knock the pioneers off their pedestal with their first Arcade-style shoot 'em up *Alerion*?

Alerion is a vertically scrolling, blast everything in sight type game which bears an uncanny resemblance to the 1984 Atari Coin-Op hit Xevious. The object is simple: you must travel up the screen shooting targets both in the air and on the ground. For this you have Air to Air and Air to Ground missiles which can be fired independantly of each other. Liberal usage of both is required if you are to succeed in your mission. ▶

Beebug have become the first company to release an Archimedes comms package. "Hearsay" is mouse driven and features automatic dialling from a database.



Silicon Vision have launched a PCB design system for the Archimedes. A demo disc is available for £5.00 and next month's Archimedes disc magazine (DAY) will feature screens. Priced from £99. Autorouting from £195.

The Mission

Apparently you have been less than an exemplary pilot in the past, so as reward your superiors (no pun intended) have sent you on a mission that they have every confidence you won't survive. However if you do, your past track record will be cleared and you will return a hero (hurrah!). So the moral of this story is clear – don't join the Arcturian Space Fleet 'cause they don't appear to have very good union agreements.

Anyway, you have all manner of nasties to destroy and you must constantly be aware of which targets are land or air based so you can select the right weapon for the job. This may seem obvious but believe me it can be confusing in the heat of battle. Your ship has four-directional movement although in practice I found that there's enough on your plate moving left and right and firing using two different keys to worry about going up and down as well although no doubt they'll be a few of you out there who can (obviously my youth wasn't misspent enough). All gameplay keys can be defined to your specification which is handy for people with odd shaped paws.

The gameplay departs from Xevious slightly with the addition of the F bases which, when hit eight times, give you a few seconds invulnarability. You also have H bases which allow you to start from a new point if you first pass over it, thus removing the tedium of going back to square one every time you get gunned down. ▶

Scientific applications

Intelligent Interfaces' IEEE podule for the Archimedes carries ROM software to extend the operating system and provide appropriate low-level control for assembler programmers. For high-level programming BBC BASIC procedures and functions are supplied on disc and optional libraries for FORTRAN 77, ISO Pascal and C are available.

When fitteed with an IEEE card, Archimedes can communicate with up to 14 compatible test and measurement instruments such as oscilloscopes, specrum analysers, plotters and programmable power supplies. Transefer rates up to 240 Kbytes per second are possible. The computer can be configured as the system controller or a a simple talker/listener device.

Details from Intelligent Interfaces on ☎ 0789 415875

Conclusion

As the rest of the crew in the office will testify this is quite an addictive game. The combination of good graphics and sampled sounds help of course but the actual gameplay itself is what really makes this game a winner. That and the Hi-score Table being saved to disc. My one complaint of the game is the control. **Why** do people insist on using the keyboard for gameplay when there's a perfectly good mouse waiting to be used? Anyway with that gripe out of the way a big thumbs up to Dabs for a first rate game. May it be the first of many!

Darrin Williamson

S.S.Pardesi

MORPH

Morph (taken from meta*morph*osis) is a program which animates one wrefreame drawing into another. Both of the drawings are created by the user with the aid of the Archimedes mouse

Morph is very easy to use. Once you've typed it in and saved it you can load the file from the desktop or BASIC

Once Morph is loaded and running the user is presented with a small title page. Once a key has been pressed a menu of options is displayed. Each option is chosen by placing the mouse pointer on the option and pressing the LEFT mouse button.

new chosen speed, choose option (a).

(c) ALTER PLOTTING SENSITIVITY

This option allows the user to vary the rate of response at which the lines will be drawn when using the mouse. The lower the number the more 'jerky' the lines will seem. For example if the user wants to draw smooth curves then a high number is best. To exit from this option and to return to the

(f) DRAW NEW PICTURES

This is the option that allows the user to draw his/her two drawings. Once the option has been chosen, the user can draw lines by using the LEFT mouse button. As the user places lines on the screen, a counter (*points*) can be seen being incremented. This stores the number of 'points' being used. It is displayed as both of the drawings *must* have the same number of points.

The MIDDLE button erases the last point drawn; a further depression will erase the point before that, and so on until all the points have been erased.

Once the user is satisfied with the first drawing, he/she exits to draw the second by pressing the RIGHT mouse button. When the user has clocked up the same number of points as in the first drawing the program

(a).

will automatically exit to the menu. To see

These options are (from left to right):

(a) ANIMATE PICS

This option animates the user's two drawings once they have been drawn (or loaded, see option (e)). To exit from this option and to return to the menu press the RIGHT mouse button.

(b) CHANGE ANIMATION SPEED

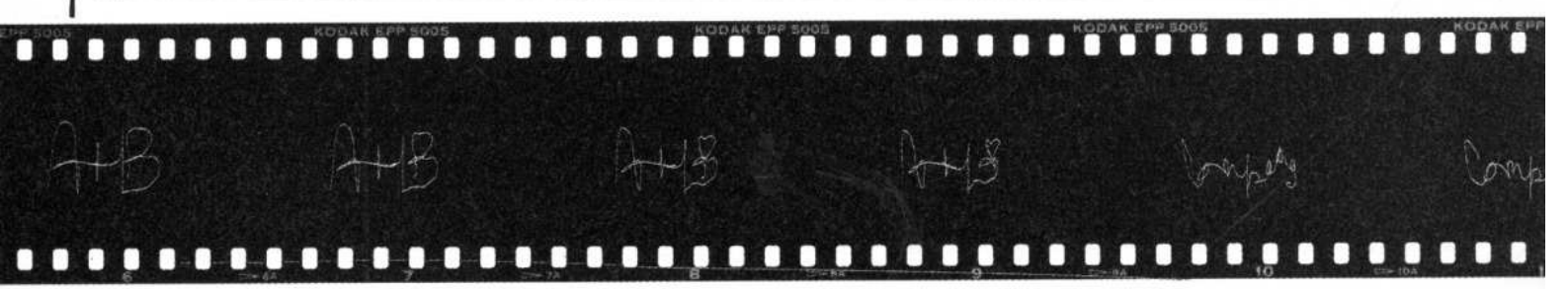
This option allows the user to vary the speed at which the current drawings are animated. The left and middle mouse buttons are used to decrease or increase the speed, respectively. To exit from this option and to return to the menu press the RIGHT mouse button. To see the drawing being animated at the menu press the RIGHT mouse button.

(d) SAVE PICTURES

This option allows the user to save the current drawings onto disk, allowing good demos etc to be saved. If this option has been chosen by mistake, simply press <RETURN>, which will return you to the menu.

(e) LOAD PICTURES

This option allows the user to load pre-saved drawings from disk, once loaded they can be animated using option (a). As with option (d), if this option has been chosen by mistake, simply press <RETURN>, which will return you to the menu.



the drawings being animated choose option **(g) QUIT**
This option allows the user to exit from the program.

Demonstration drawings

Morph is included on this month's *Archimedes Disk Magazine (order number DA7)* along with a number of demonstration "morphs". These include A&B turning into COMPUTING, MORPH into ARCHIMEDES and Bugs Bunny into a gun.

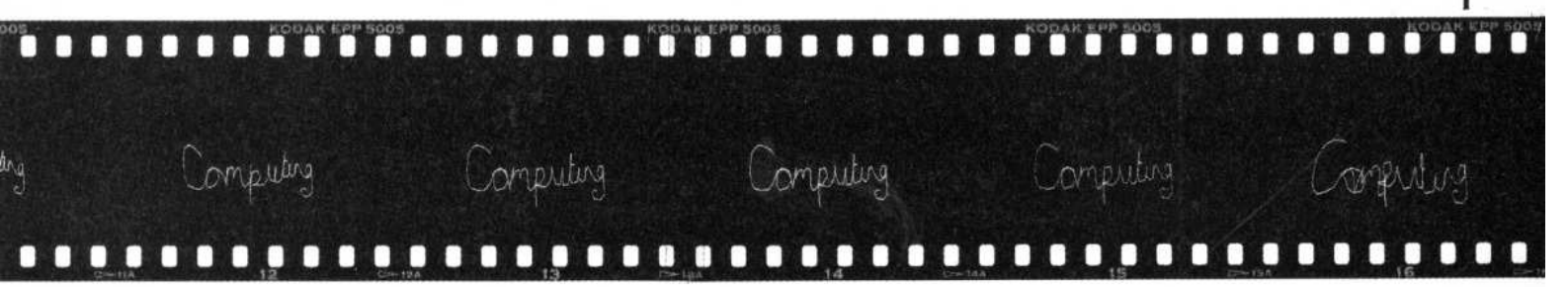
Competition

Send in your in-betweening masterpieces to: Morph A&B Computing Number One Golden Square London W1R 3AB
We'll return your disk with our current collection added to it FREE and we'll enter you for our £50 software competition.

The in-betweening animation judged best by the editor on October 30th will be awarded a £50 software selection: Archimedes 3D Construction Set, Global View, Easy Font and Adventurescape.

♦ LISTING I ♦

```
   10 REM>MORPH
   20
   30 REM  metaMORPHosis S.S.P
ARDESI. (C)1988
   40
   50 ON ERROR MODE0:REPORT:PR
INT " AT LINE ";ERL:END
   60 PROCsetup_screen
   70
   80 PROCinst
   90 PROCinitialise_variables
  100 PROCmenu
  110 END
  120
  130 DEFPROCdraw_new_pics
  140 PROCinitialise_screen
  150 PROCdraw_first
  160 PROCdraw_second
  170 PROCcalculate_a_bit
  180 OK=TRUE
  190 ENDPROC
  200
  210 DEFPROCinitialise_variab
les
  220 NP%=300
  230 DIM X%(NP%),Y%(NP%),A%(N
P%),B%(NP%)
  240 DIM XI(NP%),YI(NP%)
  250 DEL%=20
  260 SEC%=100
  270 CNT%=0:FCNT%=0
  280 AS%=1
  290 ENDPROC
  300
  310 DEFPROCinitialise_screen
  320 PROCsetup_screen
  330 MOUSE ON
  340 MOUSE RECTANGLE 0,0,1279
,850
  350 RECTANGLE 0,0,1279,850
  360 CNT%=0:FCNT%=0
  370 AS%=1
  380 ENDPROC
  390
  400 DEFPROCdraw_first
  410PRINT "LEFT : Place Point
        MIDDLE : Erase Previo
us Points          RIGHT : Exit
"
  420PRINT TAB(25,3) "Points s
o far plotted (Max ";NP%;") :
"
  430 REPEAT:MOUSE X%,Y%,Z%:UN
TIL Z%=0
  440 REPEAT
  450 MOUSE XPOS%,YPOS%,BUT%
  460IF BUT%=4 THEN PROCdraw_l
ine(X%(),Y%(),59)
  470IF CNT%>0 AND BUT%=2 THEN
 PROCerase(X%(),Y%(),59)
  480UNTIL BUT%=1 OR CNT%=NP%
  490 IF CNT%=0 THEN 440
  500 FCNT%=CNT%
  510 ENDPROC
  520
  530 DEFPROCdraw_second
  540 CLS
  550 RECTANGLE 0,0,1279,850
  560PRINT "LEFT : Place Point
        MIDDLE : Erase Previo
us Points          AUTOMATIC EX
IT"
  570 PRINT TAB(7,3) "Points i
n FIRST picture : ";FCNT%
  580 PRINT TAB(43,3) "Points
in SECOND picture : "
  590 REPEAT:MOUSE X%,Y%,Z%:UN
TIL Z%=0
  600 CNT%=0
  610 REPEAT
  620 MOUSE XPOS%,YPOS%,BUT%
  630 IF BUT%=4 THEN PROCdraw_
line(A%(),B%(),70)
  640 IF CNT%>0 AND BUT%=2 THE
N PROCerase(A%(),B%(),70)
  650 UNTIL CNT%=FCNT%
  660 ENDPROC
  670
  680 DEFPROCcalculate_a_bit
  690 FOR I%=1 TO CNT%
  700 XI(I%)=(X%(I%)-A%(I%))/S
EC%
  710 YI(I%)=(Y%(I%)-B%(I%))/S
EC%
  720 NEXT I%
  730 ENDPROC
  740
  750 DEFPROCanimate(BE%,EN%,S
P%)
  760 FOR I%=BE% TO EN%-1 STEP
 SP%
  770 BANK%=BANK% EOR 3:SYS 6,
112,BANK%:CLS
  780 MOVE A%(1)+(XI(1)*I%),B%
(1)+(YI(1)*I%)
  790 FOR J%=1 TO CNT%
  800 DRAW A%(J%)+(XI(J%)*I%),
B%(J%)+(YI(J%)*I%)
  810 NEXT J%
  820 SYS 6,113,BANK%:WAIT
  830MOUSE XPOS%,YPOS%,BUT%:IF
 BUT%=1 EXIT=TRUE:ENDPROC
  840 NEXT I%
  850 A$=INKEY$(25)
  860 ENDPROC
  870
  880 DEFPROCinst
  890 PRINT
  900 PRINT TAB(30) "metaMORPH
osis ver 1.0"
  910 PRINT
  920 PRINT TAB(30) "(C) S.S.P
ardesi  1988"
  930PRINT
  940 PRINT
  950 PRINT "This program allo
ws the user to draw two wire f
rame pictures which the comput
er"
  960 PRINT
  970 PRINT "then animates by
transforming the first picture
 into the second."
  980 PRINT
  990 PRINT
 1000 PRINT TAB(25) "* * PRESS
 ANY KEY TO CONTINUE * *"
 1010 A$=GET$
 1020 ENDPROC
 1030
 1040 DEFPROCdisplay
 1050 EXIT=FALSE
 1060 MOUSE OFF
 1070 REPEAT
 1080 PROCanimate(1,SEC%,ABS(A
S%))
 1090 PROCanimate(SEC%,2,ABS(A
S%)*(-1))
 1100 UNTIL EXIT=TRUE
 1110 MOUSE ON
 1120 OK=TRUE
 1130 ENDPROC
 1140
 1150 DEFPROCerase(QA%(),WS%()
,TAB%)
 1160 GCOL 0
 1170 MOVE QA%(CNT%-1),WS%(CNT
%-1)
 1180 DRAW QA%(CNT%),WS%(CNT%)
 1190 GCOL 1
 1200 MOVE QA%(CNT%-1),WS%(CNT
%-1)
 1210 CNT%-=1
 1220 PRINT TAB(TAB%,3);CNT%;"
  ";
 1230 A$=INKEY$(30)
 1240 ENDPROC
 1250
 1260 DEFPROCdraw_line(QA%(),W
S%(),TAB%)
 1270 CNT%+=1
 1280 IF CNT%=1 THEN MOVE XPOS
%,YPOS%
 1290 QA%(CNT%)=XPOS%:WS%(CNT%
)=YPOS%
 1300 DRAW XPOS%,YPOS%
 1310 PRINT TAB(TAB%,3);CNT%
 1320 A$=INKEY$(DEL%)
 1330 ENDPROC
 1340
 1350 DEFPROCmenu
 1360 REPEAT
 1370 OK=FALSE
 1380 PROCsetup_screen
 1390 MOUSE ON
 1400 PRINT TAB(0,0) "ANIMATE
```



```
PICS.","CHANGE ANIMATION SPEED
","ALTER PLOTTING SENSITIVITY"
 1410 PRINT TAB(0,2) "SAVE PIC
TURES","   LOAD PICTURES","
 DRAW NEW PICTURES","  QUIT"
 1420 MOUSE RECTANGLE 0,925,12
79,98
 1430 REPEAT
 1440 MOUSE X%,Y%,Z%
 1450 IF FNrec(0,990,210,32) A
ND CNT%>0 THEN PROCdisplay
 1460 IF FNrec(315,992,357,32)
 AND CNT%>0 THEN PROCalter_spe
ed
 1470 IF FNrec(800,992,1220,32
) THEN PROCalter_plotting
 1480 IF FNrec(0,930,210,32) A
ND CNT%>0 THEN PROCsave_pics
 1490 IF FNrec(385,930,210,32)
 THEN PROCload_pics
 1500 IF FNrec(704,930,276,32)
 THEN PROCdraw_new_pics
 1510 IF FNrec(1150,930,1220,3
2) THEN PROCquit
 1520 UNTIL OK
 1530 UNTIL FALSE
 1540
 1550 DEFFNrec(XC%,YC%,WC%,HC%
)=X%>XC% AND X%<XC%+WC% AND Y%
>YC% AND Y%<YC%+HC% AND Z%=4
 1560 ENDPROC
 1570
 1580 DEFPROCquit
 1590 MODE 0
 1600 END
 1610 ENDPROC
 1620
 1630 DEFPROCalter_plotting
 1640 PROCsetup_screen
 1650 PRINT TAB(0,0)"LEFT : De
crease Sensitivity"," MIDDLE :
 Increase Sensitivity","    RI
GHT : Exit"
 1660 PRINT TAB(23,3)"Current
Sensitivity (0-45) : ";50-DEL%
 1670 REPEAT:MOUSE X%,Y%,Z%:UN
TIL Z%=0
 1680 REPEAT
 1690 MOUSE X%,Y%,Z%
 1700 IF Z%=4 AND DEL%<50 DEL%
+=1
 1710 IF Z%=2 AND DEL%>5 DEL%-
=1
 1720 PRINT TAB(52,3);50-DEL%;
"  "
 1730 A$=INKEY$(7)
 1740 UNTIL Z%=1
 1750 OK=TRUE
 1760 ENDPROC
 1770
 1780 DEFPROCalter_speed
 1790 PROCsetup_screen
 1800 PRINT TAB(0,0)"LEFT : De
crease Speed"," MIDDLE : Incre
ase Speed","   RIGHT : Exit"
 1810 PRINT TAB(26,3)"Current
Speed (1-";CNT%;") : ";AS%;"
"
 1820 REPEAT:MOUSE X%,Y%,Z%:UN
TIL Z%=0
 1830 REPEAT
 1840 MOUSE X%,Y%,Z%
 1850 IF Z%=2 AND AS%<CNT% AS%
+=1
 1860 IF Z%=4 AND AS%>1 AS%-=1
 1870 PRINT TAB(48,3);" ";AS%;
"  "
 1880 A$=INKEY$(15)
 1890 UNTIL Z%=1
 1900 OK=TRUE
 1910 ENDPROC
 1920
 1930 DEFPROCsave_pics
 1940 PROCget_filename("SAVE")
 1950 IF F$="" THEN OK=TRUE:EN
DPROC
 1960 A=OPENOUT F$
 1970 PRINT# A,CNT%
 1980 FOR I%=1 TO CNT%
 1990 PRINT# A,X%(I%),Y%(I%),A
%(I%),B%(I%)
 2000 NEXT I%
 2010 CLOSE# A
 2020 OK=TRUE
 2030 ENDPROC
 2040
 2050 DEFPROCload_pics
 2060 PROCget_filename("LOAD")
 2070 IF F$="" THEN OK=TRUE:EN
DPROC
 2080 A=OPENIN F$
 2090 INPUT# A,CNT%
 2100 FOR I%=1 TO CNT%
 2110 INPUT# A,X%(I%),Y%(I%),A
%(I%),B%(I%)
 2120 NEXT I%
 2130 CLOSE# A
 2140 PROCcalculate_a_bit
 2150 AS%=1
 2160 OK=TRUE
 2170 ENDPROC
 2180
 2190 DEFPROCsetup_screen
 2200 MODE 0
 2210 OFF
 2220 ENDPROC
 2230
 2240 DEFPROCget_filename(M$)
 2250 REPEAT
 2260 PROCsetup_screen
 2270 PRINT TAB(0,0);"Enter fi
lename to ";M$
 2280 PRINT TAB(0,4)
 2290 *MOUNT
 2300 *CAT
 2310 INPUT TAB(0,2) "Filename
(Max 10 characters) : ";F$
 2320 UNTIL LEN(F$)<11
 2330 ENDPROC
```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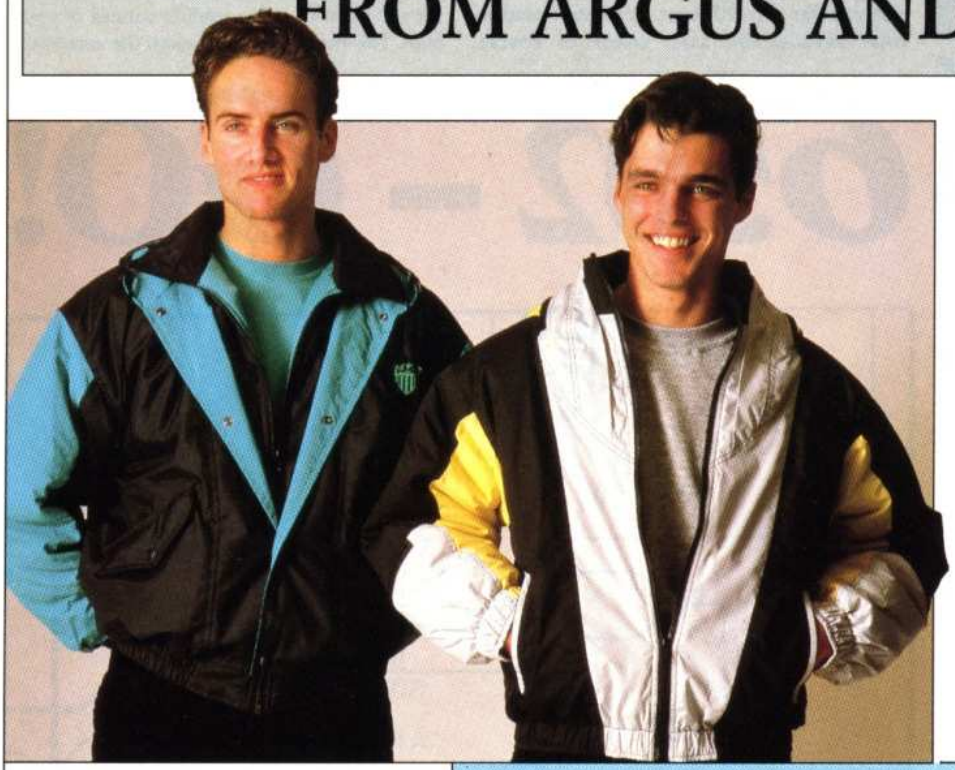

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Robin Burton

programs, and the micro world is far worse for this than the mainframe industry. (Might as well flush out the irate letters in one go!) Look at both sides of the coin, then decide for yourself. The right method for you is the one you get on with best. It doesn't matter what anyone else says, unless of course they're paying you to write the code in a certain way!

The first prerequisite is that you are competent in BASIC, your micro has BASIC 2 or 4, you understand the 6502's instruction set and want to write useful routines of your own. This month we begin with the essentials.

6502 – GO!

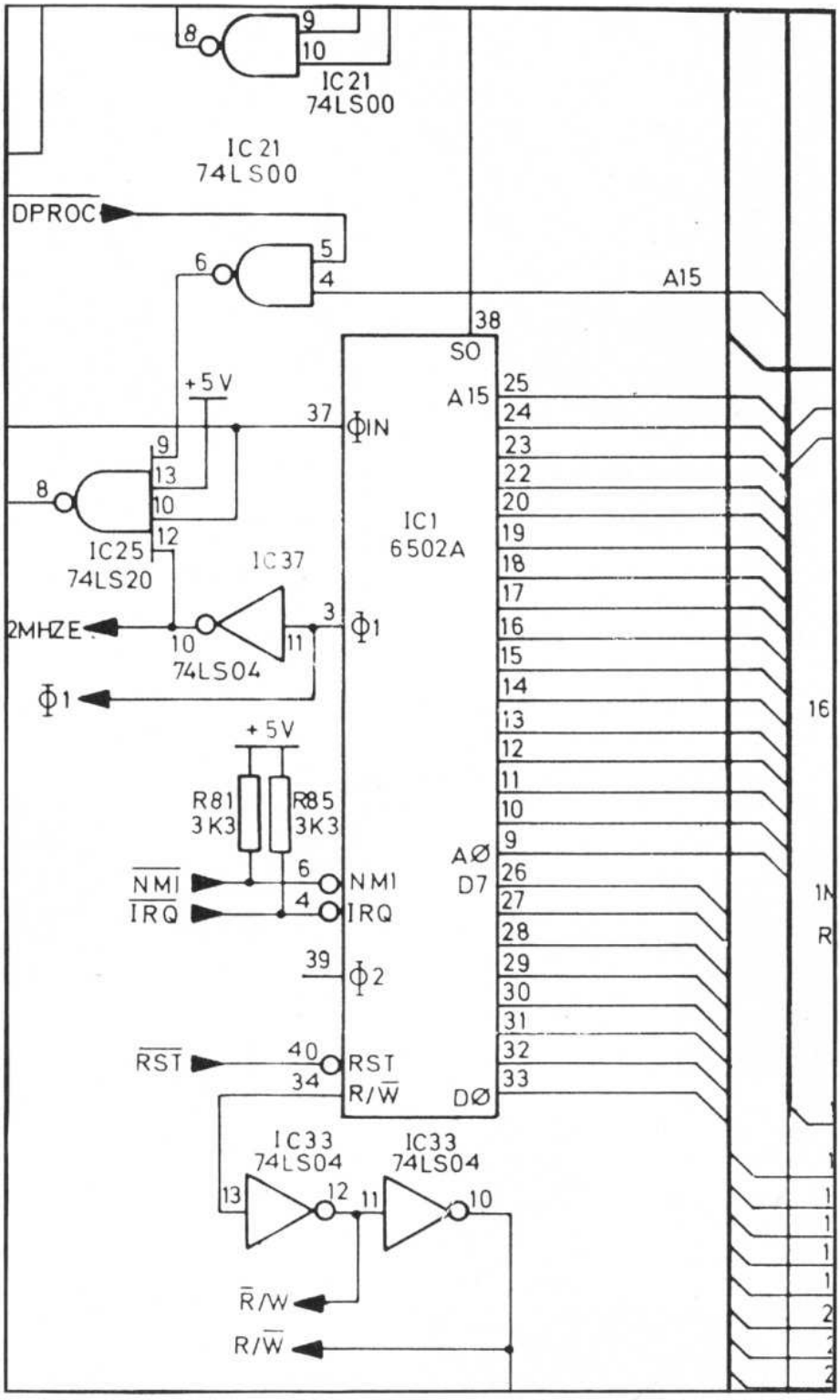
Kicking off a new series of 6502 assembly language programming – but with a difference!

There have been any number of articles on the subject of learning 6502 assembler code, and plenty of the *Introduction to* variety of books. What seemed to me to be missing when I first wrote machine code for the BBC micro was neither the elementary nor the highly advanced, it was the information in the middle. Most of the standard sources don't show you how to write usable or relevant routines, nor do they go very far into techniques either. What we'll be trying to do in this series is to provide you with at least some of this information.

Where do you turn when you're an adequate, if not expert BASIC programmer? You understand in principle the 6502's instructions, you know what you want to do, but need practical help and example, not a byte by byte instruction tutorial. I can well remember the sort of question I had trouble finding answers to in my early days of programming the BBC micro, and there are dozens of them.

What tools are needed to do the job? How do you assemble very large sections of machine code? Where can you run it? Could it be in sideways RAM so it doesn't use main memory? If so, how and with what limitations – if not why not? How are large amounts of DATA included in machine code? What are vectors, interrupts and events? Do you need them? How do you OPENUP a disc file in machine code? How do you read or write RS423 data? How do you read keyboard entries?

These are the questions we'll be addressing in these articles. It won't be a *You Will Do It Like This!* series, perhaps more *Confessions of a Programmer*. I dare say some points may raise an eyebrow or two, all to the good. There's an incredible amount of cant spouted about how you should or should not write



The heart of the machine – a close-up of the 6502 circuit diagram.

For example, what are the necessary tools and ancillaries, how best can you write, prepare and assemble the code with of course one or two tips thrown in?

Tools Of The Trade

To begin with you'll need at least one and perhaps a couple of books for reference. Let's kill one silly idea before we go any further. It's easy to think that experienced programmers know everything, and some would like you to believe it. It's not true.

I write commercial software, both for the Beeb and for large mainframe computers, but when I write even a BASIC program for the BBC I often go back to the user guide to check something. I couldn't begin to remember the details for everything I need to know, and I wouldn't waste my time trying. What are manuals for? Unless you write the same type of code on the same type of machine every day, you can't remember everything, so don't try to. The "expert" part of programming isn't having the memory (much less the brains) of an elephant, it's knowing what you're looking for, where to find it and understanding how to use it when you do.

Three books stand out as being indispensable for writing 6502 assembler programs. The first is "**The Advanced User Guide**" (AUG) by Bray, Dickens and Holmes, at £10.95. This contains most of the information you'll need if your routines will be fairly simple "add-ons" to BASIC programs, or you're writing exclusively for a Model B. If you have a B+, Master or Compact, or if you want compatibility with them, you'll also need the "**Master Operating System**" (MOS) by David Atherton, published by Dabs Press, £12.95. This is a complete update to the AUG, and contains all the new or amended operating system calls, changes to the memory map, the new ROM service calls, as well as information on sideways RAM, ADFS and other things not included in the AUG. If you follow this route, which I would recommend, you will need both of these.

As an alternative to these two, you might consider the "**New Advanced User Guide**" by Dickens and Holmes, published by Adder and costing about £19 or £20. Clearly there's not very much to choose between the alternatives in total cost, but this volume aims specifically at the Master Series, but not the original BBC, so take a careful look at both options before you decide.

Writing The Source

When you've decided on your reference sources, how about actually writing and assembling code. What else is needed? Very little, is the answer. At an absolute minimum you can write and assemble using nothing more than BASIC, but life can be made much easier without great expense, probably without any. It's almost certain that you have a wordprocessor, and for both BASIC and machine code these provide as powerful an editor as you could wish for. In fact you'll find the search and replace facilities invaluable. If you already have a BASIC editor, as you will if you have a Master, or have something like BEEBUG's Toolkit or Clare's BROM-Plus these too can help, but for producing or amending code in bulk I think the wordprocessor is easiest.

Remember that assembler code doesn't really care about line numbers. In BASIC, for assembly purposes, the lines must be numbered as usual, but this can be added later. That's one aspect of program entry you can forget about to your advantage. More importantly, references in assembler code are to **labels**, which are simply text strings with a full stop in front of them.

It's much easier to find these in a wordprocessor document than in a BASIC program, unless it's very short. I have one program which, on balance would be more difficult and inconvenient sub-divided than as it is, in a large lump. However, it contains almost 600 lines of multiple statement code and about 250 labels. Imagine listing that in BASIC, visually searching for one of them! Listing out on paper doesn't help much either, but in a wordprocessor it's easy to handle.

Of course you can't assemble directly from a text file, so keep your "master source" as text, then spool it out and *EXEC it when you want to assemble. To make this even easier make the first three lines of the source in the wordprocessor:-

```
NEW
MODE 7
AUTO
```

This is followed by the program as text without line numbers. If you spool this out and *EXEC the spooled file back in it always creates a fresh, re-numbered program automatically. When the spooled file is exhausted just press <Esc> and save the program using the chosen name.

Source File Names

File naming conventions can simplify things too. I use a system such that the text version of a program has "SRCE" in its name, usually as the last four alpha characters, while the BASIC (ready to run) version has "PROG". If there's more than one program in a logical group I can add a number too. In this way I can see what type a file is, what it contains and where it fits at a glance. Alright, two out of ten for imagination, but it works pretty well, especially when several programs are needed to assemble the finished product.

For example, suppose I had four programs making up a sideways RAM routine. I could have text files called "SWRSRCE1" to "SWRSRCE4", while the equivalent BASIC versions would be "SWRPROG1" to "SWRPROG4". You can immediately see the file type, that all eight belong together and that they all relate to SWR. This method is especially useful for DFS users, as filenames are more restricted and you don't have a comprehensive directory structure as in ADFS. Decide on your own conventions, which of course must comply with the filing system's allowed names, but it will pay dividends if you find a system that works for you and you stick to it.

Saving Memory

As to assembling your programs, nothing special is needed. The BASIC ROM in your micro contains an inbuilt assembler which can do all that's required. There are other assemblers available, some offering quite sophisticated macro assembly and linking facilities, and operating faster than the BASIC assembler too, but the good ones cost quite a bit, and you would need to do a lot of assembler coding to justify the expense.

If you ensure that you use Mode 7 it's unlikely that you will run into serious problems of memory shortage, unless you're assembling sideways RAM software, but even so simple programming techniques can overcome many of these difficulties. Odd as it may seem, you're more likely to have problems with sideways programs in a Master than a Model B, because you can assemble directly into a RAM bank, whilst on a Master you can't.

There are some rule of thumb guidelines which are handy to know, because they can give you advance warning about when space might be likely to run out. It's a matter of personal preference, but some people prefer to write assembler with one statement per line and even add a space between the line number and the instruction. If this suits you that's fine, but be aware that you incur a huge overhead, 4 bytes for every assembly instruction, 5 if you include the space. 5 bytes is the amount BASIC needs for the line number, line length and terminating carriage return on every line. Code written like this occupies roughly 10 times the space in BASIC that it will produce in assembled code. Remember that although BASIC reduces memory utilization by tokenising its own keywords, assembler instructions are stored as straight ASCII on a character for character basis. For example look at this little loop:-

```
240.label
250 INX
260 LDA (&70),Y
270 STA (&70,X)
280 DEY
290 BNE label
```

Written this way it occupies 78 bytes in BASIC, but assembles as eight bytes of machine code! In practice the **&70** would probably be replaced by a name, and so this source could take even more space, though the assembled code would stay the same. In contrast compare:-

```
240.label INX:LDA (&70),Y:STA (&70,X):DEY:
BNE label
```

This method occupies 48 bytes, gives a ratio of six to one and is no less readable, because the whole line is a self contained logical loop. It is a personal choice, but source code written this way can save large amounts of memory. It generally makes a program easier to read too, because there's normally plenty of room for blank lines to break the code

into sections. Everything in a section forms a complete process, and everything on a line belongs together. This can have implications for maintenance and amendment too, when you return to the source code six months after you wrote it.

Alternatively you can have a huge list of single instructions. There's no visible structure at all, and blank lines are almost lost, even if you can afford them. Using multiple statements intelligently can make the physical appearance of the source much more closely match the logical functions of the program, and just as important in my book, you can see a great deal more of it on the screen at the same time. As an incidental benefit it slightly speeds up assembly too.

You can include comments in assembly programs, theoretically to make them easier to follow, but of course they necessarily must be limited. Even so they use memory as if it were going out of fashion. I much prefer to document a program separately. This uses no program space, and allows the purpose of the program to be much more properly and fully explained where it's needed.

Another, perhaps more subtle waste of memory can occur when you encode data in assembler programs. There are several ways of doing this, but some use space better than others. Suppose we want to include a list of text strings in a program, each to be used in response to an option chosen within the program. The usual method in BASIC uses DATA statements, so we might have something like:-

```
200 A%=&4000
210 PROCstore
Rest of program
.....
600 DEFPROCstore
610 REPEAT
620 READA$
630 A$=A$
640 $A%=A$
650 A%=A%+LENA$
660 UNTIL A$="*"
670 A%=A%-1
680 ?A%=255
690 ENDPROC
.....
2250 DATA "Load New File"
2260 DATA "Save Existing File"
2270 DATA "Append File"
2280 DATA "Clear All Data","*"
```

This code stores the four text items in memory at &4000, terminating each string with a carriage return, and the whole table ends with CHR$255. Our assembler program might find each string by counting the carriage returns starting from &4000, and then displaying the line up to the next one. This method of loading text or data into memory for assembly programs is perfectly valid. In fact it's quite convenient, for example to store help data for ROM software, or any large amount of text or tabular information. However, it should be used with care as it's wasteful of memory for small amounts of data.

The waste in this case is twofold, apart from the single statements. First, the wrong method of storage has been used. It uses quite a lot of BASIC in PROCstore to move the text to the place it's needed. Secondly, the data will exist in memory simultaneously in two places during execution, once in the DATA statements and again in the table. When this method is used it should be in a separate program, then only the address of the data need be passed from one source program to another by means of the integer variables A% to Z%, or implicitly by overlaying. We'll look more at both of these next month.

For short tables the **EQUate** assembler directives might be the sensible approach. To achieve the above this is how they are used:-

```
1200 .response
1250 EQUS "Load New File":EQUB &D
1260 EQUS "Save Existing File":EQUB &D
1270 EQUS "Append File":EQUB &D
1280 EQUS "Clear All Data":EQUW &FFD
```

The advantage here is that this actually forms part of the assembler code, so no additional work is needed to store the data. Furthermore, the address of "response" is set automatically during assembly. If we change any code prior to this section the value adjusts accordingly and we needn't concern ourselves. Using the first method requires us to know the exact address where the data is to be stored, the second doesn't, it's stored at "response" and that's all we need to know.

Since we're looking at the EQUate statement there's one important point to note. As far as I remember I haven't seen this written down anywhere, I think it's one of those things you're simply supposed to know. It applies when you use either EQUW (equate word, ie 2 bytes as in line 1280 above) or EQUD (equate double word, 4 bytes). When you specify the data to be stored remember that it will actually be put into memory in reverse order. To illustrate:-

```
940 .data EQUD &F1F2F3F4
```

actually stores &F4 in the byte at memory location ".data", &F3 in "data+1", &F2 in "data+2" and &F1 in "data+3". This happens because of the way the 6502 addresses memory, high byte first, but it can be very useful. If you access data a byte at a time there are essentially two ways to do it. Look at these two subroutines. They both move the values stored at ".data", a byte at a time in order, to a location called "somewhere", except that the first needs the data to be encoded "backwards".

```
1000.start LDY #0
1010.loop LDA data,Y
1020 STA somewhere,Y
1030 INY
1040 CPY #4
1050 BNE loop
1060 RTS
1070.data EQUD &F4F3F2F1
1000.start LDY #4
1010.loop LDA data,Y
1020 STA somewhere-1,Y
1030 DEY
1040 BNE loop
1050.data RTS:EQUD &F1F2F3F4
```

You can see that the second is much shorter, so it takes less space in both the source and the assembled program, but that's not all. It will execute quicker too. The data reversal in EQUW or EQUD can be used to advantage because it allows shorter loops, and incidentally gives more readable source data statements. Did you notice the other trick in the second example? Look again at the RTS in relation to ".data" in line 1050. This is done so the byte at offset zero isn't wasted, and also accounts for the -1 modification to the address of "somewhere".

This data reversal is of course irrelevant to EQUB, but you might reasonably expect it to apply to EQUS, for storing strings. You would be disappointed, it doesn't. Strings are stored as written, so unless you code them in reverse a count-down loop won't work. That said, the points above still apply, so it may well be worth reversing encoded strings.

Whatever you do, as far as possible stick to one storage method (forwards or reversed) and where you can use a known terminator rather than a stated length. &FF or &00 are both useful for this, as is &60 (the hex. value of RTS). You can then often use just one subroutine to retrieve all data, while changes to the contents or length are catered for automatically, because you'll be looking for a terminator, not counting bytes.

Assembling

Now let's take a look at the process of assembly. We'll be using the BASIC assembler, so no special software is needed. In essence your assembly code must be written as part of a BASIC program so that the BASIC ROM can process it. To distinguish the assembly code from normal BASIC, square brackets are used to start and end the assembly language section. In practice this tends to occur only once in the source, but there's nothing to stop you having several separate sections of assembly code in a single program if you want to.

The BASIC assembler is referred to as a two-pass assembler, because it may need to process the source code twice to assemble the finished program. To explain the reason we can refer to the shorter example "start" subroutine above. Assembler source code, like normal BASIC, is processed a statement (ie instruction) at a time. During the first pass a table of all label addresses in the program builds up as each label is encountered. You can see that in line 1010 the instruction refers to the label "data", but at this stage the assembler doesn't know where this label is, because it's further on in the program. This is known as a forward reference.

By the time ".data" is found in line 1050, it's too late to insert the address into line 1010, so this can only be done if the source is re-processed. This is why two passes are needed. Of course, if after the first pass a label still hasn't been found an error should be generated, so what stops an error on the first pass? The answer is, you do! This is one of the things the **OPT** command is used for. Before each pass it is necessary to set the assembler options, and one option is to ignore errors of this type. If this option is set the assembler uses the current memory location as a dummy label address so that the total length of the code remains correct. This is necessary so that label addresses found later are evaluated at the correct address.

Of course if errors are to be ignored there's no point in displaying a list, so another option controls this. The final option is to inform the assembler that the code is to be assembled into one memory location, but it's intended to run at a different one, just as it might be for sideways software. This is often referred to as offset assembly. The options are actually logical bit flags, and as there are three bits (options) there are eight possible combinations, (0 to 8) though not all are very useful. In fact the options default to *no-action* values, and if you want a facility you must request it. There's no need to delve any deeper into this, so the options are shown below in decimal form. To set any particular option just use the required value. To set any two, or all of them, the values are added together.

```
Value Means
0 Nothing enabled
1 Enable errors
2 Enable list
4 Enable offset assembly
```

Generally, for absolute assembly zero is used on the first pass, meaning no list, ignore errors, and 3 for the second (1+2) meaning enable list, enable errors. Offset assembly just requires the addition of the bit-3 value to these giving 4 and 7, meaning the same as 0 and 3 but with offset assembly. The usual way to code these in BASIC is a FOR – NEXT loop, with the assembler code in between, like this:-

```
150 FOR opt% = 0 TO 3 STEP 3
170 [OPT opt%
180 Assembler code here
.....
600 ]
610 NEXT
```

There's something else though. The assembler hasn't been told where the assembled code is expected to run, so this must be included. In this case let's say we want the code to ***RUN** at &4000. We'd need a line at 160 to set this, which might take the form:-

```
160 P% = &4000
```

Notice that P% (the program pointer) is set on both passes, because it's within the FOR – NEXT loop. This is vital. As the assembler processes the source the value of P% is continually updated, and in fact it's the value in P% which is used as the dummy address for unknown labels during the first pass. After the first pass, therefore, P% must be re-set to the correct value before the second pass can begin.

If offset assembly is needed O% points to the location into which the code is to be assembled, but P% must still point to the address where the code is to run. Using the example above, let's say we want the code to assemble into memory at &4000, but it will be *LOADed or *RUN at &2000. This address may not be available at assembly time, perhaps the BASIC source code itself is occupying the space, so offset assembly is the answer, and line 160 might then be:-

```
160 O% = &4000:P% = &2000
```

This stores the assembled code at &4000, but all internal label addresses relate to a program start address of &2000

It is also useful to set a variable to the addresses to be used instead of literals, then these can be used after assembly to save the code. For example, if code% is the start address and run% is the load address, here's how you do it:

```
130 code% = &4000:run% = &2000
150 FOR opt% = 4 TO 7 STEP 3
160 O% = code%:P% = run%
170 [OPT opt%
180 Assembler code here
.....
600 ]:NEXT
610 code$ = STR$~code%
620 run$ = STR$~run%
630 len% = O%-run%
640 len$=STR$~len%
650 A$="*SAVE PROGRAM "+code$+"+"+
len$+" "+run$
660 OSCLI A$
```

Next Month

● Next month we'll look at assembling multiple source programs using overlays and other methods. We'll also examine the different ways machine code can be used.

Robin Burton is a professional programmer of both Mainframe and Micro systems – he is the Author of the Hyperdriver and the MiniDriver printer support packages currently being sold by DABs Press.

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FIVE ALIVE

Jonathan Evans takes to BASIC 5

Jonathan Evans

Well, I've finally bought myself an Archimedes. The major reason for doing so was the fact that I enjoy programming both as a hobby and for more serious applications that commercial software packages do not always cater for. The thought of all that computing power combined with superb high-res colour graphics was too much to resist.

All that and the compatibility with the BBC micro that I have so enjoyed programming for the last few years. I fully expected Acorn to continue the tradition of making the operating system fully accessible to those who prefer BASIC and other high level languages to the arcane mysteries of assembly language. I was not disappointed – and indeed the facilities for programming in BASIC 5 are quite outstanding as I shall explain.

For this series of articles I shall concentrate on programming in BASIC 5. Not only is this language supplied as standard with each machine, but this extraordinarily powerful implementation of BASIC will, I am sure, be adequate for the majority of applications that Arc owners might wish to write. The language is also extremely well documented in the User Guide which Acorn supply with the computer.

The Programmers Reference Manual- an additional purchase – will be required by people who intend to write partially in assembly language or by those who want to attempt ambitious BASIC programs making systems calls to some of the powerful facilities of the Arthur Operating System – such as the Window Management System – which are not directly implemented as BASIC commands.

I have two target groups of readers in mind for these articles, both with some knowledge and experience of BASIC programming. The first group are Archimedes owners requiring some advice and suggestions on getting the best out of the new machine. The second group are those BBC owners who are thinking of upgrading and looking for reasons to justify the expense! With the second group in mind initially, I will discuss briefly the environment provided for BASIC programming before starting to consider some of the many extensions to the language itself.

The BASIC environment

The first and most obvious aspect of the environment derives from the general machine architecture which provides computing power in terms of memory, speed and graphical facilities of a totally different magnitude to that available on earlier BBC and Master series machines. With the many powerful operating system utilities available for calling within BASIC programs it is clearly going to be possible to implement software ideas that would be impossible dreams on the BBC. However, I did not realise until I actually got my hands on an Arc exactly how enhanced the specific programming environment is.

For example, if you type HELP. you get a list of all the commands in BASIC 5 (see Table 1). If you then type HELP CIRCLE or whatever key word you fancy, you get a brief specification of its usage on the screen. I find this very handy, especially for exploring some of the new words that Acorn have added to the language. The best thing about the new environment, however, is the BASIC editor which is truly excellent.

You can, if you wish, enter and edit your programs in the traditional BBC manner, using AUTO, LIST and the line copy editor. However, you will be much better off typing EDIT and using the resident editor. When you first type a program in it appears to work like AUTO, with new line numbers supplied as you type Return. If you make a mistake, however, you find that it is a full screen editor, just like a wordprocessor, allowing you to move the cursor anywhere for deletion and insertion. In fact, the editor has many powerful facilities for string search and/or replace, and for moving, copying or deleting single lines or blocks of lines and so on.

Table 1

Examples of use of HELP facility in BASIC 5

```
>HELP.
AND         ABS         ACS         ADVAL       ASC         ASN         ATN
AUTO
APPEND      BGET        BPUT        BEATS       BEAT        COLOUR      CALL
CASE
CHAIN       CHR$        CLEAR       CLOSE       CLG         CLS         COS
COUNT
CIRCLE      COLOR       DATA        DEG         DEF         DELETE      DIV
DIM
DRAW        ENDPROC     EDIT        ENDWHILE    ENDCASE     ENDIF       END
ENVELOPE
ELSE        EVAL        ERL         ERROR       EOF         EOR         ERR
EXP
EXT         ELLIPSE     FOR         FALSE       FILL        FN          GOTO
GET$
GET         GOSUB       GCOL        HIMEM       HELP        INPUT       IF
INKEY$
INKEY       INT         INSTR(      INSTALL     LIST        LINE        LOAD
LOMEM
LOCAL       LEFT$(      LEN         LET         LOG         LN          LIBRARY
LVAR
MID$(       MODE        MOD         MOVE        MOUSE       NEXT        NEW
NOT
OLD         ON          OFF         OF          ORIGIN      OR          OPENIN
OPENOUT
OPENUP      OSCLI       OTHERWISE   PRINT       PAGE        PTR         PI
PLOT
POINT(      POINT       PROC        POS         QUIT        RETURN      REPEAT
REPORT
READ        REM         RUN         RAD         RESTORE     RIGHT$(     RND
RECTANGLE   RENUMBER    STEP        SAVE        SGN         SIN         SQR
SOUND       SPC
STR$        STRING$(    STOP        STEREO      SUM         SWAP        SYS
TAN
TAB(        TEMPO       THEN        TIME        TINT        TO          TRACE
TRUE
TWINO       TWIN        UNTIL       USR         VDU         VAL         VPOS
VOICES
VOICE       WHILE       WHEN        WAIT        WIDTH
>HELP CIRCLE
CIRCLE [FILL] x,y,r: draw circle outline [solid].
```

For those who think that this sounds similar to the EDIT program on the Master 128, I can assure you that it is far superior to use. The reason is that the Master's program is a straight text editor which doesn't know about line numbers. The beauty of the Archimedes EDIT is that it takes care of line numbers entirely for you to the extent that you can forget their existence altogether (the last vestigial excuses for GOTO have been removed with the extra control structures of BASIC 5).

You cannot, in fact, edit the lines numbers at all but every time you insert a line or move a blocks of lines, the editor will intelligently supply an appropriate line number or renumber the whole program as required. I quickly found myself editing programs as if they were being written in PASCAL through a text editor, and totally ignoring the inaccessible numbers at the side except for reference following an error message.

Another excellent addition to the BBC BASIC programming environment is that of a procedure library facility which is described later on. There are also improvements in the error trapping and debugging facilities. Particularly useful is the command LVAR which should be typed after a program has run (or crashed!) and the BASIC variable heap is still intact (ie the program has not been edited). This shows the names of current variables with values as well as procedures defined and any procedure libraries that have been installed in memory. This will save a lot of time for those who like to PRINT the values of variables as an aid to debugging.

A less happy aspect of the environment is that associated with the DESKTOP program which is now the default startup option of the Archimedes. This program, for those unfamiliar with the machine, provides a WIMP environment with access to clock, diary etc and also permits one to search through the ADFS directories and run a correctly configured BASIC program with a double click of the mouse. Clicking any file not recognised as BASIC will cause the machine to hang up and require use of either Control-Break or the Reset button.

You may well decide to *CONFIGURE the DESKTOP out of the start-up state (*CONFIGURE LANGUAGE 4, followed by Control-Break, powers the machine up in BASIC). Apart from other problems I was forced to do this as Shift-Break (as well as Control-Break) otherwise reloads the desk top and prevents some program discs from booting. However, *DESKTOP is still useful – in principle – because it allows some operations such as formatting a disc or locating and loading a BASIC program to be done without recourse to * commands.

It took me a little while to discover how to prepare BASIC programs which DESKTOP will recognise, since this did not appear to be documented in the manuals. The first line needs to read REM > filename. This header will also be recognised by the BASIC editor and the filename supplied by default when you take the save file option.

The next problem which had me baffled for a while is that any files loaded or saved by a BASIC program to be run from DESKTOP must include a full path specification (eg $.GAMES.MYGAME). The reason for this is that despite opening a window on to the directory from which you run the program, DESKTOP leaves the ADFS directory set at the root, or whatever directory was active when you entered it. This is a bizarre and bad feature of DESKTOP since it means that you cannot use it to locate and then exit to the required directory but must use *DIR instead. It also means that an unsuspecting BASIC program run from the DESKTOP is likely to receive 'file not found' errors because it is trying to load from root rather than its own directory.

Another problem created by DESKTOP is that it fails to leave the machine in a clean state on exit to BASIC. For example, function keys are disabled and do not respond to programming by *KEY. This problem clears itself if you enter and exit the BASIC editor, though there may be simpler solutions that I have not yet found (let us know if you have-ED). I was also baffled when first using the sprite editor programming SEDIT to find it already full of sprites on entry – actually the icons for disks, clocks, calendars etc used by DESKTOP. The answer to this one is to edit SEDIT to include an early *SNEW which clears any existing sprites from the machine's memory. Remember, however, to leave the special REM as the first line.

Extensions to BASIC

Returning to the positive, BASIC 5 is considerably extended over any of the BBC versions and is now approaching the power of PASCAL (bar pointers, records and user-defined data types). Some of these extensions relate to the enhanced hardware with respect to graphics, sound and access to operating system routines. These routines, and the extended string handling facilities of BASIC 5, will be dealt with in later articles. Here I will be discussing two aspects of the language which extend the internal logical control available to the programmer.

First of all, there are additional loop and logical control structures which mean that all but the most stubborn of Spectrum trained programmers should now abandon their evil GOTO habits for good. These structures include a CASE statement to define different actions for alternative values of a variable and which can save much tedious use of IF statements (see Table 2 for an example). There is also a WHILE..ENDWHILE loop which, unlike REPEAT..UNTIL, allows checking of a condition before the loop which need never be entered. The most important addition, however, is that of

IF..THEN..ELSE blocks of the form:

IF statement
THEN (one or more program lines)
ELSE (one or more program lines)
ENDIF

The absence of this structure – and the CASE construct – in earlier versions of BBC BASIC forced programmers either to use GOTOs to jump over a block of lines or else to use unnecessary additional procedures whenever the action of an IF statement would not fit on to a single multistatement line.

The other general extensions to the power of the language concern the way in which variables and arrays are handled and the extended facilities for passing such structures as arguments in procedure calls. One important addition is that operations are permitted on whole arrays. For example, following a statement such as DIM A(5,12), B(5,12) one may initialise all entries in an entire array by

A()=5 or perform arithmetic operations on two corresponding arrays such as A() += A()-B()

which would subtract each corresponding B value from its A equivalent and return the result in the cells of A. Note that += – another addition – is used for incrementing a variable (and -= for decrementing) – ie x += y is equivalent to x = x + y. In addition to being able to multiply cells in corresponding arrays – A()*B() – one can also perform matrix multiplication using the syntax A().B() providing A and B are dimensioned as two dimensional matrices of correct correspondence. This is an amazing facility to provide directly in BASIC.

Table 2

```
   10 REM CASE STATEMENT DEMO
   20
   30 FOR month = 1 TO 12
   40   PRINT "Month ";month;"
has ";FNmonthdays(month);"
days"
   50 NEXT
   60 END
   70 :
   80 DEFFNmonthdays(month)
   90 CASE month OF
  100   WHEN 2 : =28
  110   WHEN 4,6,9,11 : = 30
  120   OTHERWISE: = 31
  130 ENDCASE
  140

Month  1 has 31 days
Month  2 has 28 days
Month  3 has 31 days
Month  4 has 30 days
Month  5 has 31 days
Month  6 has 30 days
Month  7 has 31 days
Month  8 has 31 days
Month  9 has 30 days
Month 10 has 31 days
Month 11 has 30 days
Month 12 has 31 days
```

The other important change is in the use of parameters passed to procedures and functions. Compiled languages such as PASCAL allow pointers as well as values to be passed to procedures, allowing both arrays to be arguments and for values to be returned in argument lists. Acorn have implemented similar facilities in BASIC 5.

The absence of these functions in earlier versions of BBC BASIC has been a source of much frustration to programmers familiar with more powerful languages. For example, any procedure designed to handle arrays previously had to use a globally defined array of fixed name.

If you wanted to call the procedure for a number of different arrays in the same program you would have to transfer them to the named array first. Similarly, the limitation of returning only one value from a function forced use of global variables making well structured programs and library procedures harder to construct. The advantages of the new facilities are best illustrated by a procedure library for array handling (Listing 1) which is discussed below.

Array handling library

The short library shown in Listing 1 is provided both for tutorial illustration of methods and for usefulness in its own right. Before discussing the procedures, however, it is worth expanding on the library facility itself. This is a most excellent addition to the language and far superior to all the *SPOOL and *EXEC stuff which made procedure libraries more trouble than they worth on the BBC.

BASIC 5 permits the use of one or more library files consisting of collections of procedures saved as normal BASIC programs on the disc you are using. These libraries can then be made available to the current program simply by using either of two commands. LIBRARY <filename> in your program will load the library at the top of your program on the variable heap and is hence lost when you edit the program and needs reloading. Alternatively you can use INSTALL <filename> which stores the file at the top of memory (lowering HIMEM). An INSTALLed file will remain in memory until you quit BASIC and need be loaded only once.

However, INSTALL is best typed in command mode because if you include it in a program which you are editing duplicate versions will be installed on each run. Finally, you may prefer actually to merge the library with your current program – for example to permit minor editing of library procedures – in which case you simply type APPEND filename and it is added to the top of the program in memory.

In none of these cases do you have to worry about clashing line numbers, although files loaded by LIBRARY or INSTALL must have no lines using GOTO etc with direct line number references. APPEND automatically renumbers the appended code.

There are, however, some sensible guidelines for procedure libraries laid down in the User Guide. All variables used should be declared LOCAL so as to avoid clashes when called from as yet unthought of programs. They also suggest that you include a procedure which describes the contents of the file, giving names of procedures and the types of arguments they accept. This is because a file included by LIBRARY or INSTALL cannot be LISTed directly.

However, the first line is shown by LVAR and might include the name of the description procedure. I have preferred to keep the first line as a REM to the filename and adopt the convention of having a procedure PROCdescribe−<filename> which is named according to the library in which it resides.

The procedures PROCsortI and PROCsortS use a similar exchange sort algorithm for sorting integer and string arrays respectively. Since array arguments are passed by reference rather than value, any change to the contents of the array is automatically returned to the calling routine. Note the use of the line

```
n%=DIM(A%(),1)
```

This is an extended form of the DIM command which permits you to discover the size of any dimension of a previously DIMed array. These procedures assume that a one-dimensional array or vector will be passed and automatically adjust their loops to its actual size.

Those new to BASIC 5 will also note the use of WHILE and SWAP in the procedures. PROCranindex generates integers 1 to n in random order in an index array. An application of this is shown in the next procedure PROCranstrings which randomises the order of an array of strings passed to it as a parameter. This first calls PROCranindex and then uses the index to change the order of entries in A$. This is achieved very simply by creating a LOCAL array B$() for temporary use, transferring all string from A$() to B$() (by simply B$() = A$()) and then using the index to copy strings back from B$ to A$ in the correct order. Wonderful!

Unlike arrays, variables passed in argument lists are treated as LOCAL and hence changes in their value are not normally returned to the calling routine. However, BASIC 5 permits variables to be prefixed by RETURN in the parameter lists so that changes do affect the corresponding variables in the calling program. An application of this is shown in PROCvectorstats which computes the mean and standard deviation of an array of real numbers passed as an argument, automatically returning the two computed values to the calling routine.

CONCLUSIONS

I must confess that my enthusiasm for using BBC BASIC had waned quite a lot in the past year or so, due to my experience of other programming languages such as PASCAL. However, Archimedes BASIC, and the environment in which it resides, is so superior to earlier versions that my interest is thoroughly revived!

I particularly like the fact that the resident editor and the extensions of the language mean that you can forget line numbers entirely. With the excellent library facility in addition, this language is ideally suited to the construction of really large but well structured programs of the kind needed to exploit the facilities of this extraordinary machine. I hope that this article has whetted the appetite of current and potential owners of the machine who are still attracted to the idea of creating their own software. There are, of course, many other fascinating aspects of programming in the Archimedes BASIC environment which I will deal with in later articles.

♦ LISTING 1 ♦

```
  10 REM >ARRAYLIB
  20 REM ARAYLIB - library of
array handling procedures
  30 REM (C) Jonathan Evans,
July 1988
  40
  50 DEFPROCdescribe_arraylib

  60 PRINT "PROCsortI(A%())
 - sorts integer array into
ascending sequence"
  70 PRINT "PROCsortS(A$ ())
 - sorts string array into
alphabetical order"
  80 PRINT
"PROCrandindex(A%)) - creates
index array with integers 1
to"
  90 PRINT "
 - length of the array in
random sequence"
 100 PRINT
"PROCranstrings(A$(),index%())
"
 110 PRINT "
 - randomises order of items
in string array"
 120 PRINT
"PROCvectorstats(A(), RETURN
mean, RETURN sd)"
 130 PRINT "
 - computes statistics for 1D
array of real nos"
 140 ENDPROC
 150
 160 DEFPROCsortI(A%())
 170 REM Sorts an integer
array into ascending sequence
 180 LOCAL
n%,i%,highest%,hipos%,temp%
 190 n%=DIM(A%(),1)
 200 WHILE n% >1
 210 FOR i%=1 TO n%
 220 REM Find highest number
in the list
 230 IF i%=1 THEN
 240 highest%=A%(i%):
hipos%=1
 250 ELSE
 260 temp% = A%(i%)
 270 IF temp% > highest% THEN
highest%=temp%: hipos%=i%
 280 ENDIF
 290 NEXT i%
 300 REM Swap highest number
with last in list
 310 SWAP A%(hipos%),A%(n%)
 320 REM reduce length of
list by 1
 330 n%-=1
 340 REM continue until left
with a list of 1 item
 350 ENDWHILE
 360 ENDPROC
 370
 380 DEFPROCsortS(A$())
 390 REM Sorts a string array
into alphabetical order
 400 REM See PROCsortI for
comments on method
 410 LOCAL
```

▶

```
n%,i%,highest$,hipos%,temp$
  420 n%=DIM(A$(),1)
  430 WHILE n% >1
  440 FOR i%=1 TO n%
  450 IF i%=1 THEN
  460 highest$=A$(i%):
hipos%=1
  470 ELSE
  480 temp$ = A$(i%)
  490 IF temp$ > highest$ THEN
highest$=temp$: hipos%=i%
  500 ENDIF
  510 NEXT i%
  520 SWAP A$(hipos%),A$(n%)
  530 n%-=1
  540 ENDWHILE
  550 ENDPROC
  560
  570 DEFPROCranindex(A%())
  580 REM Fills array with
integers 1 to n% in random
sequence
  590 REM where n% is the size
of the array
  600 LOCAL n%,i%,rand%
  610 n%=DIM(A%(),1)
  620 REM Fill array with
integers 1 to n% in order
  630 FOR i%=1 TO n%
  640 A%(i%)=i%
  650 NEXT i%
  660 REM randomise order
  670 FOR i% = n% TO 2 STEP -1

  680 rand%=RND(i%)
  690 SWAP A%(rand%),A%(i%)
  700 NEXT i%
  710 ENDPROC
  720
  730
DEFPROCranstrings(A$(),index%(
))
  740 REM Sorts array of
strings into random sequence
  750 REM index% must be
integer array of equal length
  760 LOCAL i%,n%,B$()
  770 n%=DIM(A$(),1)
  780 DIM B$(n%): REM Local
array for temporary use
  790 B$()=A$()
  800 PROCranindex(index%())
  810 FOR i%=1 TO n%
  820 A$(i%)=B$(index%(i%))
  830 NEXT i%
  840 ENDPROC
  850
  860
DEFPROCvectorstats(A(),RETURN
mean,RETURN sd)
  870 REM Computes and returns
mean and standard deviation
  880 REM of a vector (1D
array) of real numbers
  890 LOCAL i%,n%,sum,sumsq
  900 n%=DIM(A(),1)
  910 sum=0:sumsq=0
  920 FOR i%=1 TO n%
  930 sum+=A(i%)
  940 sumsq+=A(i%)^2
  950 NEXT
  960 mean = sum/n%
  970 sd =
SQR((sumsq-sum^2/n%)/(n%-1))
  980 ENDPROC
```

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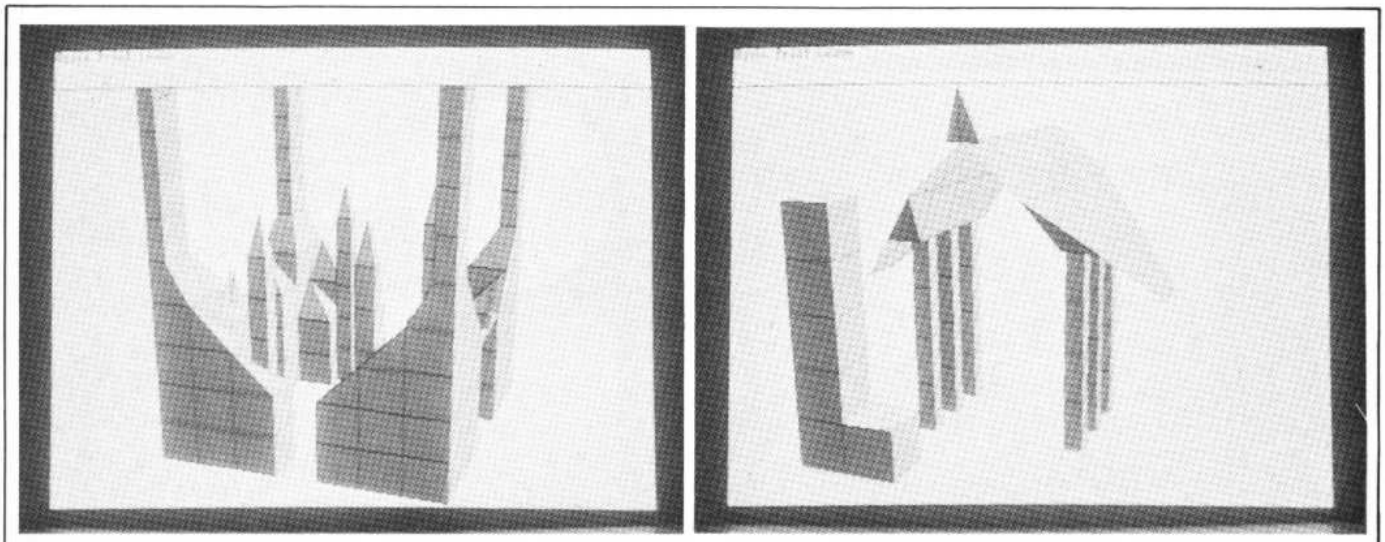

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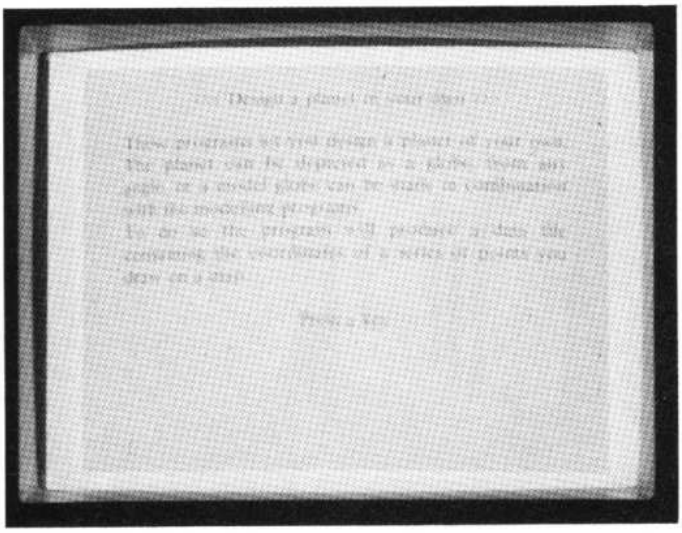

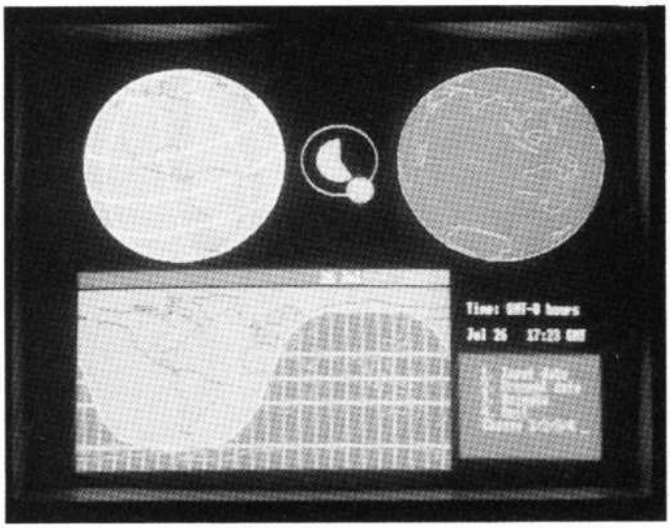

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There's a roundup of all the best games for the Archimedes (there are more than you think!) and a special sneak preview of a few biggies in the pipeline as well!
We will be having the A&B top ten games list and a special-super Arcade issue with more cheats, more pokes, more fun!
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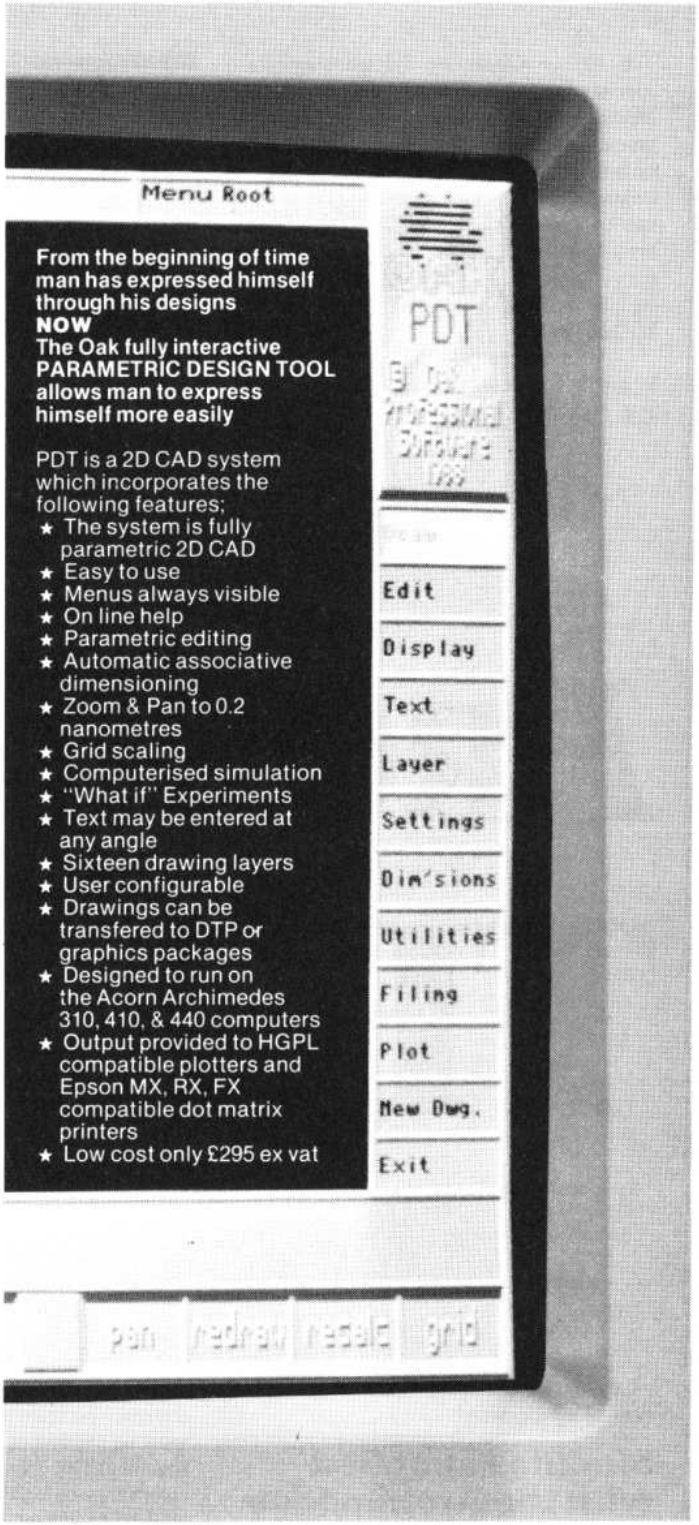

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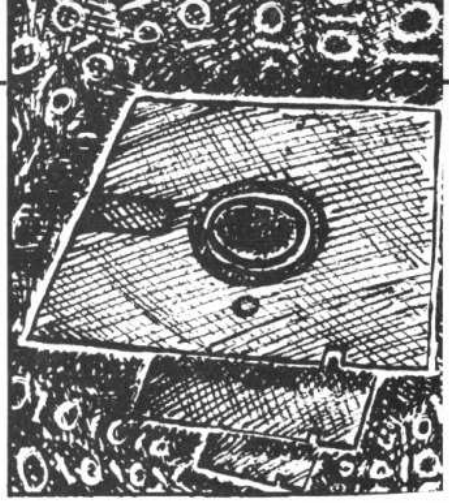

Following on from our Module Maker program – Paul Fellows asks the question "What are relocatable modules?"

PROGRAMMING THE ARM

The Arthur Operating System supports a special class of programs called *Relocatable Modules*; they can contain applications programs such as wordprocessors, spreadsheets or language systems. Equally, they can provide utilities programs such as debuggers or they can be extensions to the Operating System providing extra *commands or even complete filing systems. In this way they are the equivalent of sideways ROMS on the 6502 BBC micros.

In this article I will describe what relocatable modules are, why they are useful and present a program – ModuleMaker – which makes the task of building modules very straightforward.

Modules supplied with the Archimedes

The vast majority or the Arthur operating system is composed of a collection of modules. For example, there are *applications modules* (the BASIC interpreter and the BASIC Editor). There is a *utility module* (the Debugger) and a *service module* (SpriteRM). You can easily see which modules are provided by typing

***HELP MODULES**

This will print a complete list of the names of the modules which are present and give information about which versions they are. You will see that there are quite a few.

What does *Relocatable* mean ?

The most important feature of modules under the Arthur Operating System is that the machine code which they are made up of must be capable of running at **any** position in memory. This means that they must not use references to particular addresses but must always use offsets. This allows modules to be loaded one after another into whatever memory happens to be available. Hence it is possible to add a new module at any time, to remove modules and to produce modules which run equally well in ROM (which is at a very high address) or in normal memory. Another command is provided which lets you examine where in memory the modules are placed. Typing

***MODULES**

will present you with a list of the modules together with two sets of addresses. The first is the address of the start of the module in memory. For ROM-resident modules these will start 038 and for any modules which are loaded into memory they will start 018. The second value is the address of the workspace which the module has obtained. This obviously has to be in RAM and starts 018. This shows an interesting point about the memory which modules use.

Modules and memory – the RMA

The Operating System sets aside an area of memory called the *Relocatable Module Area* (RMA for short) when the machine is started. Any modules in the ROM which need workspace ask for the amount that they would like and the operating system allocates a chunk from the RMA.

If you load any modules from disc, they are placed into further chunks of memory which the operating system obtains from the RMA. In addition, if these modules need workspace it will be allocated to them from the same area.

The RMA can therefore become quite a complicated area of memory, with modules and areas of workspace mixed in together.

Since modules are not necessarily always present or since the amount of workspace

which they request may vary, no module can rely upon its workspace being in the same place each time. This means that as well as the code being relocatable, a module must always use offsets from the start of the workspace which it is given rather than fixed addresses.

If the Operating System runs out of space in the RMA it "grabs" some more from the top of the application area – ie the value of HIMEM in BASIC will be lower than it would have been. It is interesting to compare this with the behaviour of sideways ROMs on the previous BBC micros which also claimed workspace but they did it by increasing the value of PAGE. The value of HIMEM was dictated by the screen MODE. For example adding the Disc Filing System to a Model B raised page from &0E00 to &1900. Under Arthur PAGE always remains the same, it is HIMEM that moves.

Of course, if a program is using the application workspace at the time this could be very inconvenient so the Operating System kindly asks permission first and the program can easily refuse to agree. For example, BASIC treats the whole of the application workspace as its own and refuses to cooperate. This will usually result in the error message **No room in RMA** being given.

Commands for handling modules

The operating system provides a number of *commands which start off with the two letters "RM". These all do things with Modules.

***RMLOAD**
This loads a module from disc into the RMA and initialises it.

***RMREINIT**
This re-initialises a module which is already present as if it has just been loaded. It can also be used to re-instate a ROM resident module which has been *UNPLUGged.

***RMRUN**
This loads a module, initialises it and, if it contains an application program, starts it up.

***RMTIDY**
This tidies up the RMA. It tells Arthur to go off and shuffle memory about to collect all the spare bits of memory in the RMA into one lump. This is something which you are unlikely to want to do since it involves killing all of the modules and restarting them at a different addresses.

***RMKILL**
This kills off a module. Modules can refuse to be killed if they have an over-inflated sense of there own importance. For example the first module in the list is the utility module. This is a very important part of the operating system and nothing would work if it were removed. The module will come back to life when RMREINIT is used or when a <Break> is performed. It is possible to remove ROM-resident modules more permanently by using the *UNPLUG command – which is named thus because of the similarity with sideways ROMS.

***RMCLEAR**
This clears out the RMA. It kills off as many modules as it can and, like *RMTIDY, is an act of such unspeakable violence against the operating that you should only use it in dire emergencies!

Format of a module

The operating system recognises that a program is a module in two ways.

- The type of the file could be marked as &FFA. A file marked with this type will be treated as a module when it is *RUN or *LOADed.
- The bytes at the start of the module must be in a special format. This is again analogous to sideways ROMs on the BBC micro which had a 'ROM header' in a special format which gave information about the software.

The format of a module header is a shown in **table 1**.

Table 1

Address offset	Contents
(&00) 0	Start
(&04) 4	Initialisation
(&08) 8	Finalisation
(&0C) 12	Service
(&10) 16	Title String
(&14) 20	Help String
(&18) 24	Command table
(&1C) 28	SWI chunk base number
(&20) 32	SWI handler
(&24) 36	SWI decode table
(&28) 40	SWI decode handler

Each entry is four bytes long and contains the distance (in bytes) from the start of the module to the point where the code or data for that entry starts. The last four entries are optional and only need to be supplied if the module supplies additional SWI calls.

The *ModuleMaker* program constructs a header in this format from the information which you give it.

One additional fact which you need to know to understand modules is that the operating system reserves one word (4 bytes) of memory for each module when it is loaded. This is initially the only private memory which the module has. Each time the module is called up through one of its entry points the Operating System puts the address of this "private word" into register 12 so that the module can get at it easily.

The entries in detail:

Start

This normally contains the offset to the start of the application code. If the module is purely a service module and cannot be started up as an application then this value should be zero.

Initialisation

This contains the offset to the code which is run when the module is loaded or after the RMA has been tidied. This code must initialise everything which other entry points require. Any workspace required should be claimed at this stage and the address of the block saved in the private word (pointed to by R12). If no action is required then this value should be zero.

Finalisation

This contains the offset to the code which is run immediately prior to the module being killed. The code must deal with either 'fatal' calls which are made before the module is killed completely or 'non-fatal' calls which are made before the module is killed temporarily whilst the RMA is being tidied. If this value is zero then no action is taken other than to free the workspace pointed to by the modules private word.

Service

This contains the offset to the code which handles service calls. If the module wishes to perform the service the code should set R1 to zero before returning. Otherwise it should preserve all the registers so that the call can be passed to other modules. If the module is not interested in any service calls then this value should be zero.

Title string

This contains the offset to the start of a null-terminated string which is used to refer to the module. This string must not contain spaces or control characters but can contain either upper or lower case characters since

they are treated as being equivalent. If the value is zero then a title of spaces is used.

Help string

This contains the offset to the start of a null-terminated string which is printed out by *HELP before any other information. This string may contain spaces but must not contain control characters. The format used by existing modules is as follows:

Module name <TAB> v.vv (DD MMM YYYY)
...where <TAB> is an ASCII character 9 and v.vv is the version number, for example 1.20 and DD MMM YYYY is the date, for example 13 Feb 1988. If you stick to this format the display from *HELP MODULES will be kept tidy!
If this value is zero then nothing is printed, however not providing help information is regarded as a very antisocial thing to do!

Command table

This contains the offset to the start of another table. This table contains a list of keywords provided by the modules and information about each in the format in **table 2**:

Table 2

String to match, null-terminated
(ALIGN to a word boundary
Offset of code from module start
Information word
Offset of invalid syntax message from module start, null-terminated
Offset of help text from module start, null-terminated

```
   10REM >Example
   30DIM code% 1000
   50Object$="Object"
   70FOR opt%=0 TO 2 STEP 2
   90P%=code%
  110[OPTopt%
  120\\
  130\\ Enter here in reponse
to the module command.
  140\\
  150\\ Note - code will run i
n supervisor mode so be carefu
l
  170.start%
  180 STMFD R13!,{R1-R6,R14}
  200 ADR R6,commandptr%  \\ P
oint R6 at the command table
  220.processcommand%
  240 LDR R4,[R6]       \\ Get
the offset to the text
  260 TEQ R4,#0           \\ A
 zero value marks the
  270 BEQ notrecognised%  \\ e
nd of the list.
  290 ADR R3,start%     \\ Get
the base pointer
  300 ADD R4,R4,R3      \\ and
de-relativise it.
  320 MOV R5,R0           \\ M
ake a copy of the pointer to t
he command
  330.nextchar%
  340 LDRB R2,[R5],#1     \\ G
et a byte from the command and
 step on 1.
  350 ORR R2,R2,#&20      \\ F
orce it to lower case.
  360 LDRB R3,[R4],#1     \\ G
et a byte from the text and st
ep on 1.
  380 TEQ R3,#0           \\ I
f we have got to the end of th
e text string
  390 BEQ matches%        \\ t
hen the match has succeded.
  410 TEQ R2,R3           \\ I
f the characters are the same
then carry on
  420 BEQ nextchar%       \\ p
rocessing until the end of the
 string.
  430 B nextcommand%      \\ o
therwise the match has failed.
  450.matches%
  460 LDR R14,[R6,#4]  \\ Get
the offset
  470 ADR R4,start%     \\ poin
t at the base
  480 ADD PC,R4,R14     \\ and
jump.
  500.nextcommand%
  510 ADD R6,R6,#8       \\ Ste
p on to the next
  520 B processcommand% \\ pos
sible command
  540.notrecognised_msg%
  550 EQUD 1
  560 EQUS "Bad parameter":EQU
B 0
  570 ALIGN
  590.notrecognised%
  600 ADR R0,notrecognised_msg
%  \\ Point R0 at the error bl
ock
  610 FNsetV
   \\ and return with the V fl
ag
  620 LDMFD R13!,{R1-R6,PC}
   \\ set to indicate an error

  640.commandptr%
  660 EQUD text1%-start%: EQUD
 comm1%-start%
  670 EQUD text2%-start%: EQUD
 comm2%-start%
  680 EQUD 0              : EQUD
0
  700.text1%
  710 EQUS "cross":EQUB 0:ALIG
N
  720.text2%
  730 EQUS "square":EQUB 0:ALI
GN
  740.comm1%
  760 MOV R0,#&15
  770 ADR R1,data1%
  780 ADR R2,shape1%
  790 STR R2,[R1,#6]
  800 SWI "XOS_Word"
  810 LDMFD R13!,{R1-R6,PC}
  820.comm2%
  830 MOV R0,#&15
  840 ADR R1,data2%
  850 ADR R2,shape2%
  860 STR R2,[R1,#6]
  870 SWI "XOS_Word"
  880 LDMFD R13!,{R1-R6,PC}
  900 ALIGN    \\ Deliberately
place the data1% label at a ha
lf-word
  910 EQUW 0  \\ alignment so
that the EQUD at the end is wo
rd-aligned
  920.data1%
  930 EQUB 0
  940 EQUB 1  \\ Shape number
  950 EQUB 8  \\ Width
  960 EQUB 16 \\ Height
  970 EQUB 15 \\ X
  980 EQUB 15 \\ Y
  990 EQUD 0  \\ shape pointer
 - filled in at run time
 1010 ALIGN    \\ Deliberately
place the data2% label at a ha
lf-word
 1020 EQUW 0  \\ alignment so
that the EQUD at the end is wo
rd-aligned
 1030.data2%
 1040 EQUB 0
 1050 EQUB 1  \\ Shape number
 1060 EQUB 8  \\ Width
 1070 EQUB 16 \\ Height
 1080 EQUB 15 \\ X
 1090 EQUB 15 \\ Y
 1100 EQUD 0  \\ shape pointer
 - filled in at run time
 1120\\ The cross hair pointer
 shape.
 1130.shape1%
 1140 EQUD &40000000:EQUD &000
00000
 1150 EQUD &40000000:EQUD &000
 1510 EQUD &00000001:EQUD &400
00000
 1520 EQUD &55555555:EQUD &555
55555
 1540]
 1550NEXT
 1570OSCLI("SAVE "+Object$+" "
+STR$~start%+" "+STR$~P%)
 1580END
 1600DEFFNsetV
 1610[OPTopt%
 1620 CMP PC,#&80000000
 1630]
 1640=""
>
 00000
  1160 EQUD &40000000:EQUD &00
00000
  1170 EQUD &40000000:EQUD &000
00000
  1180 EQUD &40000000:EQUD &000
00000
  1190 EQUD &40000000:EQUD &000
00000
  1200 EQUD &40000000:EQUD &000
00000
  1210 EQUD &55555555:EQUD &555
55555
  1230 EQUD &40000000:EQUD &000
00000
  1240 EQUD &40000000:EQUD &000
00000
  1250 EQUD &40000000:EQUD &000
00000
  1260 EQUD &40000000:EQUD &000
00000
  1270 EQUD &40000000:EQUD &000
00000
  1280 EQUD &40000000:EQUD &000
00000
  1290 EQUD &40000000:EQUD &000
00000
  1300 EQUD &40000000:EQUD &000
00000
  1320 \\ The Square pointer sh
ape
  1330.shape2%
  1340 EQUD &55555555:EQUD &555
55555
  1350 EQUD &00000001:EQUD &400
00000
  1360 EQUD &00000001:EQUD &400
00000
  1370 EQUD &00000001:EQUD &400
00000
  1390 EQUD &00000001:EQUD &400
00000
  1400 EQUD &00000001:EQUD &400
00000
  1410 EQUD &00000001:EQUD &400
00000
  1420 EQUD &00000001:EQUD &400
00000
  1440 EQUD &00000001:EQUD &400
00000
  1450 EQUD &00000001:EQUD &400
00000
  1460 EQUD &00000001:EQUD &400
00000
  1470 EQUD &00000001:EQUD &400
00000
  1490 EQUD &00000001:EQUD &400
00000
  1500 EQUD &00000001:EQUD &400
00000
```

The string to match should not contain spaces or control characters, in general it is best to stick with the upper and lower case letters. Again, the Operating System sorts out the conversion between upper and lower case for you however, the exact text with you give is used to generate the response to *HELP commands – so keep it neat!

The offset to the code enables the Operating System to jump in to the right place when it spots your command.

The information word contains several things, the most important being the limits on the numbers of extra arguments which the command will accept. You should specify the minumum number in the lowest byte of this word and the maximum number in the third byte. The second and fourth bytes hold other information which is beyond the scope of this article, suffice to say you should set them to zero.

The Operating System checks these limits and will only run the command if it is satisfied. Otherwise, it uses the offset to the invalid syntax message and prints out the message which it finds there. In general this should be something like:

Syntax : Widget <arg1> <arg2>

To indicate that the command "Widget" expects two and *only* two extra parameters. The ModuleMaker program will automatically construct a string like this for you.

The final entry is the offset to the help text. This text is printed when the parameter to *HELP matches your command.

If the module contains more than one command, this series of entries is simply repeated for each one. After the last one you must place a null entry, the ModuleMaker program does this by placing a sequence of EQUD 0 directives after the table.

SWI entries

The ModuleMaker program does not handle the provision of extra SWI calls. If you want to produce such a module you will have to read the reference manual.

The module maker program.

The ModuleMaker program allows you to take a piece of code which you have written and to incorporate it into a module so that it is runable as a *command. It is designed to allow only one command per module in order to keep it short, it would be fairly simple to modify it to allow more.

```
   10REM >ModuleMaker
   30REM === Manifest definiti
ons ===
   50R0=0:R1=1:R2=2:R3=3:R4=4
   60R5=5:R6=6:R7=7:R8=8:R9=9
   70R10=10:R11=11:R12=12:R13=
13:R14=14:PC=15
   90REM === Input the module
recipie ===
  110MODE 0
  120INPUT"Title string
  :"Title$
  130INPUT"Version String
  :"Ver$
  140INPUT"Command String
  :"Command$
  150INPUT"Minimum Arguments
  :"Minargs%
  160INPUT"Maximum Arguments
  :"Maxargs%
  170INPUT"Memory Required
  :"M$
  180INPUT"Code file to insert
  :"Object$
  190INPUT"File name for modul
e :"File$
  210REM === Build the rest of
 the strings ===
  230Help$=Title$+CHR$9+Ver$+"
 ("+MID$(TIME$,5,11)+")"
  250IF Maxargs%<Minargs% ERRO
R 1,"Max must be >= Min"
  251IF Minargs%<0 ERROR 2,"Mi
nimum must be > 0"
  270args$=""
  280IF Minargs%<>0 THEN
  290FORI%=1TOMinargs%
  300args$+="<arg> "
  310NEXT
  320ENDIF
  330IFMaxargs%<>Minargs% THEN
  340args$+="[ "
  350FORI%=1TOMinargs%
  360  arg$+="<arg> "
  370NEXT
  380args$+="]"
  390ENDIF
  420Command_Syntax$ = "Syntax
 : "+Command$+" "+args$
  430Command_Help$   = Command
$
  450REM ===
  470IF M$<>"" THEN
  480memory_required%=EVAL(M$)
  490ELSE
  500memory_required%=0
  510ENDIF
  530DIM code% 100000
  550FOR opt%=0 TO 2 STEP2
  560P%=code%
  570[OPTopt%
  580\\
  590\\
  600\\ The module header
  610\\
  620.startcode%
  630 EQUD 0   \\ No Applicati
on entry point
  640.initcode%
  650 EQUD module_initialise%-
startcode%
  660.finicode%
  670 EQUD 0   \\ No Finalisat
ion code
  680.servcode%
  690 EQUD module_service%-sta
rtcode%
  700.titlestring%
  710 EQUD module_title%-start
code%
  720.helpstring%
  730 EQUD module_help%-startc
ode%
  740.helptable%
  750 EQUD command_table%-star
tcode%
  760.swistuff%
  770 EQUD 0
  780 EQUD 0
  790 EQUD 0
  800 EQUD 0
  820\\
  830\\
  840\\ The Module title and h
elp text
  850\\
  860.module_title%
  870 EQUS Title$
  880 EQUB 0
  890 ALIGN
  900.module_help%
  910 EQUS Help$
  920 EQUB 0
  930 ALIGN
  950\\
  960\\
  970\\ The command table
  980\\
  990.command_table%
 1000\\
 1010\\ An entry
 1020\\
 1030 EQUS Command$
 1040 EQUB 0
 1050 ALIGN
 1060 EQUD command%-startcode%
 1070 EQUD (Maxargs%<<16)+(Min
args%)
 1080 EQUD command_syntax%-sta
rtcode%
 1090 EQUD command_help%-start
code%
 1100\\
 1110\\ Terminate the comand t
able
 1120\\
 1130 EQUD 0
 1150\\
 1160\\
 1170\\ *command which runs th
e object as a service
 1180\\
 1190.command_syntax%
 1200 EQUS Command_Syntax$
 1210 EQUB 0
 1220 ALIGN
 1230.command_help%
 1240 EQUS Command_Help$
 1250 EQUB 0
 1260 ALIGN
 1270.command%
 1280 STMFD R13!,{R7-R12,R14}
 1290 BL startobject%
 1300 LDMFD R13!,{R7-R12,PC}
 1320\\
 1330\\
 1340\\ Respond to the service
 calls
 1350\\
 1360.module_service%
 1370 STMFD R13!,{R7-R11,R14}
 1380.service_ret%
 1390 LDMFD R13!,{R7-R11,PC}
 1410\\
 1420\\
 1430\\ Claim some workspace a
nd save the pointer in the pri
vate word
 1440\\
 1450.module_initialise%
 1460 STMFD R13!,{R7-R11,R14}
 1470 MOV R0,#6 \\ reason code
 for claim memory
 1480 MOV R3,#memory_required%
 1490 SWI "XOS Module"
 1500 BVS init_ret%
 1510 STR R2,[R12]
 1520.init_ret%
 1530 LDMFD R13!,{R7-R11,PC}
 1550\\ Load the Users object
code here
 1560\\ It will be entered wit
h
 1570\\
 1580\\ R0 -> The command tail
 1590\\ R1 = Number of Argumen
ts
 1600\\ R12 -> Private Word
 1620.startobject%
 1630]
 1640PROCloadobject
 1650[OPTopt%
 1660.endcode%
 1670]
 1680NEXT
 1690OSCLI("SAVE "+File$+" "+S
TR$~code%+" "+STR$~P%)
 1700OSCLI("SETTYPE "+File$+"
FFA")
 1710END
 1730DEFPROCloadobject
 1740X=OPENIN(Object$)
 1750len=EXT#X
 1760CLOSE#X
 1770OSCLI("LOAD "+Object$+" "
+STR$~P%)
 1780P%+=len
 1790ENDPROC
>
```

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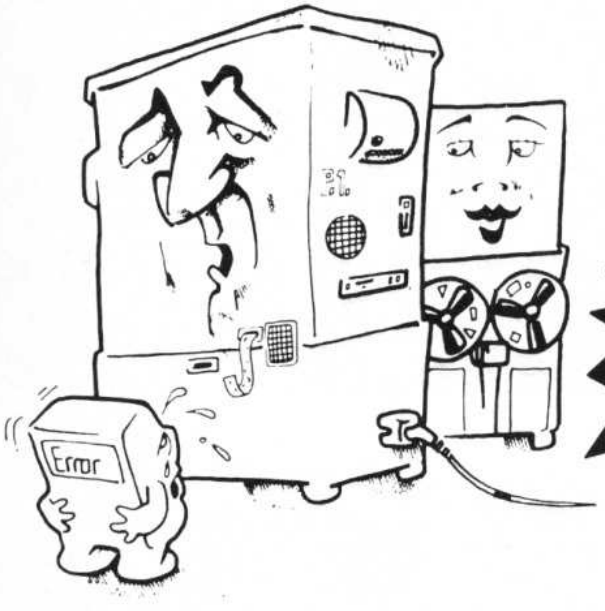

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The age of casual computing is dead. The days of devil-may-care disc swopping are over. The reason? Computer viruses.

But how much do we really know about this new technical plague?

Where do the viruses come from? How do they proliferate? Are your files at risk?

To quell the anxiety of computer users everywhere we are publishing extracts from the *Abacus Guide to Safe Computing*.

What is a computer virus?
A computer virus lives hidden in the recesses of computer software. Its sole purpose is to corrupt and destroy files. Your computer has no natural immune system to fight the virus.

Who is responsible for introducing the viruses?
Two schools of thought exist. The first says viruses are created by bored, spotty pranksters flexing their computing ingenuity by writing destructive, self-replicating routines which infect any files they come into contact with. This theory, however, has yet to be proved. The second theory, which is far more likely, is that God is punishing the computing community for past sins in the 'backing up' department.

How do viruses spread?
This question has provoked a lot of wild and unfounded speculation. Some claim that it's enough for discs to be stored close to each other and the virus can physically leap from one file to another. Frankly this is absurd as are other old wives tales about programmers sneezing near your micro or shaking hands with the man at the computer shop. The latest research makes it very clear that the method of propagation is computing which brings you into contact with large numbers of discs. If you are a practicing computer user your files are vulnerable.

What can I do to protect my files?
There is no such thing as 100% safe computing. The only foolproof way of avoiding computer viruses is to give up computers altogether. However, the natural and compulsive urge of modern man to indulge in computing activity makes this an unrealistic proposition. There are precautions that all computer users can take to minimise the risk of contamination. Don't exchange discs with someone you don't know. There used to be a time when it was quite common for someone to say "Hey, why don't I bring some of these really hot utilities over to your house tonight and we can really get down to some advanced file management." Alas, the advent of computer viruses has put an end to such naive and carefree computing. A shift in computing behaviour is taking place and you must now vet who you are computing with – you never know what may be lurking in their files.

What can I do if my files become infected?
Nothing. Once the virus is on your disc you can wave goodbye to your files. The perpetrating programmer does, however, always leave a calling card, perhaps a cute piece of on-screen animation or an endearing and witty message such as, "Hello, my name is Kevin the Terminator. As you read this I am destroying the contents of this disc." For many people the inclusion of a personal message such as this more than makes up for the annihilation of weeks of hard work.

Is there any hope of a cure?
No. There are several packages on the market which claim to track down and eradicate viruses but their success has been very limited. In the case of computer viruses time could be the great healer. If indeed it is computer whizz-kid thugs who instigate the viruses they will in time get bored and move onto other things; large scale computer fraud perhaps or working in the city, or both. If, on the other hand, computer viruses are an example of God's wrath we could be in big trouble – someone who came up with the original infinite lives poke should not be underestimated. So just in case it is the Almightly think twice before you 'back up' that disc – you could be doing us all a favour.

Designer Ponchos

So just what are trendy hip-hop computer operators wearing around the office these days? Well to find out we sent our fashion editor Alan Batchelor (the only man to buy the Great Space Race when it was full price!) to find out. Over to you Alan...

Thanks Gorgon. And a big welcome from the Paris Micro Fashion Fair where the big news is Ponchos. Yes folks all the best dressed comp-ops are wearing little radiation-proof numbers such as the one from Meditrade Marketing modelled here by the lovely Lolita who has in fact been given this item of clothing as some form of compensation for having to sit for hours in front of an ST (poor girl).

Apparently these nifty little items not only look *grate* but also protect all these ladies from miscarriages. However I would have thought that they were more in need of protection from the randy little perisher that got them all pregnant in the first place! Now back to Gorgon Vogon in the studio...

Thanks Alan and readers might like to know that one of these snazzy smock costs just £55.00 although Alan suggests one alternative might be to buy 500 dustbin liners instead which will probably work out cheaper and offer more protection.

Get stuck in

All manner of wierd and wacky events were organised for Sport Aid. This wasn't one of them. It would appear that the three lads in the foreground have been sponsored to put their right feet into a sandpit for as long as possible. However contestant number three is about to be disqualified for using the wrong foot. Never mind a substitute has been sent for and is rehearsing in the wings awaiting his big break. Alternatively they could all be waiting for their next issue of *Laserbug*.

The World of A&B – Part One

If you've ever wondered how the guys on the mag decide what goes into each issue then here's a little insight captured in fabulous *Vogonvision (TM)*. Here we see all the key A&B personnel in one of their more formal editorial discussions. **Clive** and **Darrin** obviously have a slight difference of opinion over what colour **David Janda's** introduction should be. David (peering over Darrin's head) would like to be excused for a bit of a lie down and **Mark** just wants to end it all with one of his cyanide capsules.

The frightened on-looker is a chappie from Electronics Today International magazine who turned up for the wrong meeting. You won't make that mistake again will you **Jez!**

PLAY IT AGAIN SAM 4

SUPERIOR APPROVED

FRAK!
The Unique No. 1 Hit from Aardvark
One of the most original computer games ever devised. Propel our caveman hero Trogg about the weird world of Frak!
"Go out and see it as quickly as possible." . . . A & B Computing.
"A superb game that will take you hours to master." . . . Micro User.

A Superior Hit

SPELLBINDER
Superior's Bewitching Adventure
A captivating 3D arcade-adventure full of problems to be solved by magical means.
"What is more impressive than the detailed graphics, is the sheer number of rooms comprising the two floors, three citadels, catacomb and dungeon." . . . Electron User.

NEW RELEASE

COSMIC CAMOUFLAGE
A New Release from Superior Software
An exciting, new sequel to Meteors, with many, novel, advanced features, including increasing gravity levels. Steer your laser-ship through a hail of meteors and flying saucers, smashing them with your laser bolts. When the pace gets desperate, use your Radiation Bombs or go into Warp Drive. As a last resort, install your Camouflage Cover and become invisible to the cosmic debris.

A Superior Hit

GRAND PRIX CONSTRUCTION SET
Superior Software's No. 1 Hit
A motor-racing game with a difference. It allows you to design your own race circuits, or to use one of the 18 pre-defined Grand Prix Race circuits. Race against another player or the computer.
"The track designing is a great idea and the racing runs very well." . . . Acorn User.

PLAY IT AGAIN SAM 4 for the BBC Micro and Acorn Electron

Superior Software has combined a brand new release, with three great chartbusters. The result is another top quality four-game compilation that combines variety with great value for money.

BBC Micro Cassette	£9.95	Acorn Electron Cassette	£9.95
BBC Micro 5¼" Disc	£11.95	BBC Master Compact 3½" Disc	£14.95

(Compatible with the BBC B, B+ and Master Series computers)

Please make cheques payable to "Superior Software Ltd".

ACORN ELECTRON VERSION

Unfortunately it is not technically possible to produce an Acorn Electron version of GRAND PRIX CONSTRUCTION SET. The four games on the Acorn Electron version of PLAY IT AGAIN SAM 4 are: FRAK!, SPELLBINDER, COSMIC CAMOUFLAGE and GUARDIAN.

GUARDIAN — An Alligata Software Hit — received rave reviews when first released.
"It's a classic Defender game . . . and it's very good." . . . A & B Computing.
"A fast-moving space game, with striking graphics and excellent sound effects." . . . Electron User.

SUPERIOR SOFTWARE Limited

ACORNSOFT

(Acornsoft is a registered trademark of Acorn Computers Ltd. Superior Software Ltd is a registered user.)

Dept 4PS7, Regent House, Skinner Lane, Leeds LS7 1AX. Telephone: (0532) 459453.

The screen pictures show the BBC Micro versions of the games.

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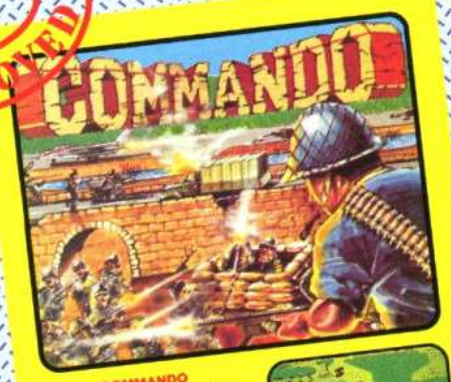
OUR GUARANTEE

- All mail orders are despatched within 24 hours by first-class post.
- Postage and packing is free.
- Faulty cassettes and discs will be replaced immediately.

(This does not affect your statutory rights)

PLAY IT AGAIN SAM 3

SUPERIOR APPROVED



COMMANDO
The Smash No. 1 Hit from Elite

Super Joe – Crack Combat Soldier – fights a lone battle against overwhelming odds. All the action and tension of the World's Number One Arcade Game.

"Non-stop Commando action" . . . The Micro User

A Superior Hit

PALACE OF MAGIC
A Superior Software Chart Topper

Over 100 screens of challenging puzzles and awesome foes. Even better than Citadel.

"This is excellent . . . I can't wait to get back to solving it!" . . A & B Computing

SUPERIOR APPROVED

KILLER GORILLA
A Classic from Micro Power

Scale the ironwork tower to answer the maiden's cries for help. Race along the girders, career along conveyers and jump on to moving elevators.

"Killer gorilla is an excellent version of the arcade game." . . . A & B Computing.

"A classic game." . . . Acorn User.

A Superior Hit

KILLER GORILLA 2
Superior's Authentic Sequel

Climb the vines, chains and laser beams, avoiding the electric spikes and vicious aardvark birds. When first released, it was awarded a maximum ★★★★★ by Home Computer Weekly.

"You'll need a lot of skill . . . the interest level remains high." . . . Popular Computing Weekly

A CHART-TOPPING COMPILATION for the BBC Micro and Acorn Electron

Superior Software has carefully selected two of the greatest games from other software houses and combined them with two of its own top hits. The result is a top quality four-game compilation that combines variety with great value for money.

BBC Micro Cassette	£9.95	Acorn Electron Cassette	£9.95
BBC Micro 5¼" Disc	£11.95	BBC Master Compact 3½" Disc	£14.95

(Compatible with the BBC B, B+ and Master Series computers)

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PRIZE COMPETITION

£100 is the first prize in our PLAY IT AGAIN SAM 3 competition, with prizes of computer games for 20 runners-up.
To enter the competition, you must answer one question about each of the four games in the compilation. To answer the questions you will need to have reached an advanced stage in each of the games.

Closing date: 28th February, 1989.

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